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MATERNAL MORTALITY

THE RISK OF DEATH IN CHILDBIRTH AND FROM ALL DISEASES CAUSED BY PREGNANCY AND CONFINEMENT

By

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LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF LABOR,
CHILDREN'S BUREAU,
Washington, August 4, 1925.

SIR: There is transmitted herewith a report on Maternal Mortality by Robert Morse Woodbury, Ph. D., formerly director of statistical research in the Children's Bureau. Miss Rena Rosenberg assisted Doctor Woodbury in the preparation of statistical material, and Miss Anna Kalet assisted in assembling information from foreign sources.

Eight years ago the bureau published a bulletin on maternal mortality because investigation showed the direct relation between maternal and infant mortality and between conditions which lead to the death of mothers in childbirth and the high death rate of infants during the first month of life.

If the statistics of maternal mortality are accepted at their face value the mortality from puerperal septicemia increased from 1900 to about 1911, since which time it has shown a slight decrease, while the mortality from other causes showed a steady increase from 1900 to 1921, with the result that the mortality from all puerperal causes has been gradually rising in the United States. In comparison with other foreign countries which have good mortality statistics the United States ranks with those having highest rates; and in many European countries the maternal mortality rate, in particular the mortality from puerperal septicemia, has shown a marked decrease during the last 20 or 30 years. In order to test whether these conclusions are correct or whether they should be modified it is necessary to study in detail the sources of error in the statistics.

The assistance of the United States Bureau of the Census was most helpful in assembling the material for the study, and the suggestions and criticisms made by Dr. William H. Davis, chief statistician for vital statistics of the bureau, were of particular importance. The registry offices in Maryland, Massachusetts, North Carolina, and Wisconsin, and the offices of the commissioner of health in Baltimore, Md., and of the city registrar in Boston, Mass., were very helpful also in connection with special studies made in these cities and States.

Dr. Grace Meigs Crowder, who wrote the previous bulletin on Maternal Mortality for the Children's Bureau, went over this manuscript with great care and made many valuable suggestions and criticisms. The Children's Bureau is also indebted to Dr. J. Whitridge Williams, Dr. William Travis Howard, Jr., Prof. Walter F. Willcox, and Dr. F. L. Adair for helpful suggestions.

Respectfully submitted.

GRACE ABBOTT, *Chief.*

Hon. JAMES J. DAVIS,
Secretary of Labor.

MATERNAL MORTALITY

INTRODUCTION

The growth of interest in the subject of the protection of the lives and health of mothers is due not only to a realization that a large proportion of the mortality and sickness caused by pregnancy and confinement is preventable but also to an appreciation of the far-reaching influence over infant mortality that is exerted by the health and condition of the mother. With reference to the preventability of mortality from puerperal causes, the knowledge that puerperal septicemia, the chief cause of this mortality, is largely preventable has been known to the medical profession since the discoveries of the transmissible nature of this disease by Oliver Wendell Holmes, Semmelweiss, Pasteur, and others. Deaths from other puerperal causes are also preventable to a very considerable degree, as careful studies of such causes and the results of the application of appropriate preventive measures show. If, then, mortality from puerperal causes is preventable, it is important to know the precautions and measures by which it can be prevented, whether these means are in use in this country, and whether preventable deaths and illnesses from these causes are actually occurring.

Interest in maternal mortality has been especially stimulated in recent years by the progress of the movement for reduction of infant mortality. A very considerable proportion of all deaths of infants under 1 year of age occur during the first month of life from causes which have their origin in the care and condition of mothers during pregnancy and confinement. For example, in 1921 in the United States birth-registration area 44.5 per cent of all deaths of infants under 1 year of age occurred during the first two weeks of life, and 8 per cent more occurred during the rest of the first month. Therefore, since nearly all the deaths in the first month are due to causes that have their origin in natal and prenatal conditions, approximately half the total number of deaths during the first year were due to such causes. In the United States as a whole it may be estimated that about 100,000 deaths of infants under 1 month of age occur every year.[1] Reduction in the mortality from these causes depends upon improvement and extension of facilities for prenatal, confinement, and postnatal care.

The causes of stillbirth, like those of deaths in early infancy, are natal and prenatal in origin, and prevention of these depends likewise upon better prenatal and natal care. In the United States little information is available regarding the number of stillbirths. Figures for the States in the birth-registration area in 1918 [2] based on stillbirths registered as births showed that for every 1,000 live births on

[1] The deaths of infants under 1 month in the birth-registration area in 1921 numbered 68,021; in the United States as a whole it may be estimated that there were at least 100,000 such deaths. Birth Statistics, 1921, pp. 7 and 238. U. S. Bureau of the Census, Washington, 1923.

[2] Exclusive of Massachusetts, Rhode Island, Washington, and the city of Baltimore, Md.

an average 40 stillbirths occurred. In the United States as a whole it may be estimated that at least 100,000 stillbirths occur each year.[3] The same measures which will safeguard the lives and health of the mothers during pregnancy and labor and which will prevent to a large extent the unnecessary mortality of mothers will also tend to reduce the stillbirth and neonatal mortality rates.

Ill health or death of the mother exerts a powerful adverse influence upon the chances of life of her child. In studies made by the Children's Bureau in eight cities the mortality from all causes among infants of mothers who died either immediately following childbirth or within one year was found to be between four and five times, and that from causes peculiar to early infancy was over seven times, the corresponding rates among other babies.[4]

The prevention of the mortality and morbidity of maternity is therefore of far-reaching interest and importance. The first step is to secure accurate and complete statistical information regarding the nature and extent of the problem. The present bulletin aims to bring together such statistical evidence with especial reference to conditions in this country. Though much progress has been made in recent years in the accumulation of statistics relating to maternal mortality, the absence of comprehensive and satisfactory data on many questions is still noteworthy. Though many questions, therefore, must remain unanswered for lack of the necessary data, the evidence that is available is sufficient for sound conclusions of great practical importance.

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[3] In the birth-registration area in 1921, at this rate of 40 stillbirths to every 1,000 live births, there were approximately 68,000 stillbirths; since the area contained 65.3 per cent of the total population it may be estimated that in the United States as a whole about 100,000 stillbirths occurred. Compiled from Birth Statistics, 1918, p. 30, and Ibid., 1921, p. 7 (U. S. Bureau of the Census).

[4] See Causal Factors in Infant Mortality, by Robert M. Woodbury, p. 34 (U. S. Children's Bureau Publication No. 142, Washington, 1925).

DEFINITION AND MEASUREMENT OF PUERPERAL MORTALITY

DEFINITION

Deaths from puerperal causes include all those of which pregnancy and confinement are the only, or the decisive, cause. For example, they include deaths from hemorrhage and from other "accidents" of pregnancy; deaths from difficult labor (dystocia); deaths from puerperal convulsions, or toxemias of pregnancy, and from puerperal infection. On the other hand, they do not include deaths resulting from accidents sustained by pregnant women if the accidents themselves were sufficient to cause death, nor do they include deaths resulting from criminal abortion.

In practice, for inclusion in the statistics puerperal deaths must be registered and must be certified by the physician in attendance or by some other person as due to or complicated by some cause connected with pregnancy or confinement and must be classified by the agency in charge of the compilation of statistics as due primarily to a puerperal cause. The procedure of registration and the accuracy of certification, so far as they affect the completeness of the record, are discussed elsewhere; they do not affect the definition. But some consideration of the rules for the classification of puerperal causes—especially for the decision, in cases in which two or more causes of death are reported, as to whether the puerperal or the other cause should be regarded as the principal one—is necessary to an understanding of the term "puerperal deaths."

According to the International List of Causes of Death in use by the United States Bureau of the Census eight groups of causes are classified as puerperal.

The titles included within each group are given in full in Appendix A, page 103, and need not be considered in this connection. When one of these causes appears in conjunction with some nonpuerperal cause on a death certificate, the death is classified according to definite rules irrespective of the order in which the causes are stated, or of the apparent assignment as primary or contributory which the physician in attendance may have indicated. Definite rules were found to be necessary in order to secure a uniform treatment of each combination of causes; for, though in theory the assignment of the preferred cause should be made by the physician in charge of the case, who is in the best position to know the relative importance of the several causes, in practice it was found that these decisions varied not only because of differences in judgment on the part of the physicians but also because of differences in interpretation of principal and primary causes. In order to secure uniformity in classification of identical combinations of joint causes in statistics for all parts of the country, all cases of joint causes are classified in accordance with definite rules, which are published in the Manual of Joint Causes of Death.

The principal rules relating to the preference of puerperal over other causes and of other over puerperal causes are as follows:

1. Most acute infectious diseases (e. g., diphtheria, smallpox) and external causes, including criminal abortion, are preferred to any puerperal cause.

2. Puerperal septicemia is generally preferred to any other cause excepting some acute infectious diseases, cancer, syphilis, or external causes.

3. A serious disease (e. g., pulmonary tuberculosis) is preferred to any puerperal cause except puerperal septicemia.

Details of the application of the rules relating to other combinations of causes are summarized in Appendix A, page 109.

The deaths classified as puerperal, then, include only those which are regarded as caused primarily by pregnancy and childbirth. Deaths to which puerperal conditions are contributory but not decisive causes are not included in puerperal mortality.

MEASUREMENT

The mortality rate from puerperal causes is best expressed in theory by comparing the number of deaths from such causes with the number of cases exposed to risk. This number of cases exposed to risk is equal, except for cases of pregnancy terminated in the early months, to the number of confinements.

Since in most countries, including the United States, statistics of confinements are not available the nearest approximation to them is the total number of births, including live births, stillbirths, and miscarriages. This number, if all births are registered, is greater than the number of confinements by the difference between the number of twins, triplets, quadruplets, etc., and the number of confinements during which they were born. The number of extra twins and triplets, however, is relatively small (the number equals only about 1 per cent of the total number of births) and is more than offset by incompleteness of registration, especially of miscarriages.

A difficulty in the use of rates of maternal mortality based upon live births and stillbirths (including miscarriages) lies in the variations in definition of stillbirth in different countries and States. The official definitions for purposes of registration differ principally in the minimum period of gestation. Some definitions require all stillbirths of more than four months' gestation to be registered; others require registration only of those of seven or more months' gestation; others have intermediate periods; and still others have alternative definitions in terms of length or weight of the fetus. The definitions in use in the several States and in certain foreign countries are given in Appendix C, page 114. A further difficulty lies in the fact that in certain countries, notably England and Wales, Scotland, Ireland, and certain States of Australia, the law does not require the registration of stillbirths.[1]

In the United States figures for stillbirths for certain areas were published by the Bureau of the Census for 1918.[2] Statistics of stillbirths are available only for certain States and cities.

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[1] Annuaire International de Statistique, Renseignements sur l'organisation actuelle de l'état civil dans divers pays, p. 6 La Haye, 1921.

[2] The annual publication of statistics of stillbirths by the Bureau of the Census was commenced in 1922.

The number of live births gives a fairly close approximation to the number of confinements. Since the number of stillbirths is equal to about 4 per cent of the number of live births and since the number of confinements is about 1 per cent less than the number of births, the number of live births, provided birth registration is complete, falls short of the number of confinements by about 3 per cent.[3]

The use of live births as a basis for calculating the maternal mortality rate yields, therefore, approximately the same result as would be secured by using the number of confinements. Since the number of confinements is about 3 per cent larger than the number of live births, the quotient obtained by using the live births only is about 1.03 times that obtained by using the number of confinements and thus very slightly overstates the true risk of dying in childbirth. On the other hand, when live births only are used, comparisons between States and countries are not subject to errors arising from differences in definition of stillbirth. (See p. 131.)

Because of the incomplete material relating to stillbirths in the United States, in the present bulletin rates of maternal mortality are calculated for the most part as deaths from puerperal causes per 1,000 live births. This rate gives the "cost" in mothers' lives of bringing into the world 1,000 live-born babies.[4]

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[3] But in comparing maternal mortality in a group, such as the negro, having an exceptionally high stillbirth rate, with that in a group having an average rate, the use of the number of live births as an approximate equivalent of the number of confinements in the two groups results in a slight overstatement of the maternal mortality rate of the former as compared with that of the latter.

[4] Other methods of measuring maternal mortality—for example, deaths from puerperal causes per 100,000 population, deaths from puerperal causes per 100,000 female population, and deaths from puerperal causes per 100,000 female population of child-bearing ages—are less valuable than rates based upon births, because they are much less closely related to the risk of death from childbirth. In the present study such rates are used only when the more accurate measures can not be applied, and in such cases the error involved by the use of the less satisfactory rates is discussed.

DEATHS FROM PUERPERAL CAUSES IN THE UNITED STATES

ESTIMATED MATERNAL MORTALITY RATE

In 1921 the United States death-registration area included 82.2 per cent of the total population. The number of deaths in this area classified as due to puerperal causes was 15,027.

Not all the States in the death-registration area have a sufficiently complete birth registration for admission to the registration area for births. In order to compare the deaths from puerperal causes with births, therefore, the figures must be limited to the area in which birth registration has been accepted by the Bureau of the Census as at least 90 per cent complete. In 1921 this area included 65.3 per cent of the total population; 11,688 puerperal deaths occurred, or 6.8 to every 1,000 live births.

From the figures of deaths in the death-registration area an estimate may be made of the total number of deaths from puerperal causes in the United States. Assuming that 15,027 is 82.2 per cent of the total number of puerperal deaths, the total number is estimated at 18,281. This procedure assumes that the death rate per 100,000 population outside the death-registration area is identical with that within it, an assumption that is probably not exactly correct. But since the error in this assumption affects only about 17.8 per cent of the total population, it can not affect materially the figure for the total number of puerperal deaths. The States outside the death-registration area of 1921 included a much larger proportion of colored and a much smaller proportion of urban population than those within it. As will be shown later, the maternal mortality rate was higher for the colored than for the white population; therefore, the assumption made for purposes of estimate tends to understate the true death rate in those States not included in the area for which death statistics are published. On the other hand, since the maternal mortality rate was higher for urban than for rural districts, the assumption that the death rate was the same outside as within the area tends to overstate the true death rate for these States so far as the fact that the excluded States had a smaller proportion of urban population is concerned. These two tendencies thus partly offset each other with the result that so far as they are concerned the estimate may be regarded as fairly satisfactory.

An estimate of the rate of maternal mortality for the United States as a whole may be made from the figure for the birth-registration area. If it could be assumed that the birth rate outside the area was equal to that within it and that the maternal mortality rate per 1,000 births outside was equal to that within the area, the average rate for the United States would be identical (6.8 to every 1,000 live births) with that found for the birth-registration area. But the States outside the area included a much larger proportion of population living in the Southern States where the birth rate is higher than in the Northern States, and a much larger proportion of negro population, for which the maternal mortality rate is high; the assumption stated above is, therefore, not correct and tends to understate the true rate. If it is assumed, however, that the birth rates and the maternal mortality rates for white and colored separately are the

same outside as within the area, the average rate of maternal mortality for the whole United States would be 7 to every 1,000 live births.

MARGIN OF ERROR

The errors in the assumptions upon which are based estimates of the total number of puerperal deaths and of the maternal mortality rate in the entire country are of secondary importance, though they serve to call attention to the differences between the maternal mortality rates for colored and for white and between those for urban and for rural populations. Of more importance is the fact that any such assumptions tend to exaggerate the errors in the basic figures from which the estimates are made. For if the basic figures are too high or too low any estimates made from them will be subject to the same proportionate error. To arrive at any conclusion, therefore, as to the true number of puerperal deaths, the errors in the basic figures must be considered.

Errors in maternal mortality rates may be due either to errors with regard to the number of deaths from puerperal causes, or to errors with regard to the number of confinements (births).

Registration and certification of deaths.

The number of deaths from puerperal causes as reported in the death-registration area is subject to errors arising from three sources: (1) Incomplete registration of deaths; (2) faulty certification of causes of death; and (3) statistical errors. These sources of error are by no means of equal importance. Their importance varies in the different States with the character of the registration law and its enforcement; with the average training and ability of physicians; and with the extent to which causes of death are certified by physicians, and the conscientiousness with which they make their certifications. These sources of error tend to become less and less important as the machinery of death registration improves and as standards of medical education are raised. As the returns become more nearly complete and accurate, the classification becomes less and less subject to error.

Incomplete registration of deaths.—The completeness of death registration depends upon the character of the death registration law, its enforcement, the number and location of registration offices, the proportion of the population living in cities, the familiarity of the population with the requirements of the law, and the strength or weakness of motives for evasion.

In view of the fact that the data are limited to the death-registration area of the United States, in which the death registration laws and their enforcement have passed the tests required for admission of a State to the area,[1] the number of deaths from puerperal causes omitted through failure to register may be considered relatively negligible. Death registration is comparatively easy to enforce through the legal requirement that no body may be buried or removed without a burial or removal permit, which may not be issued by the local registrar until after a death certificate is on file. In cities and well-populated areas, where burial in cemeteries is the rule, evasion of the law is difficult. On the other hand, in sparsely settled rural

[1] Certain types of laws are not approved by the Bureau of the Census (for example, that providing but one registrar for each county); for admission to the area death registration must be accepted by the Bureau of the Census as being at least 90 per cent complete on the basis of tests which are made when the State applies for admission.

areas, where private burial is common, evasion of the law is easy. In such areas, however, the only motive for failure to register is unwillingness to take the trouble,[2] and this motive is offset by fear of the penalties of the law. Where a population is familiar with the requirements of the law and where registry offices are comparatively easy of access this motive can play but a small part. In States with good registration laws and with populations familiar through the experience of years with their requirements, especially in States with a large proportion of the population living in places where the custom of burial in cemeteries is observed and with registry offices convenient of access to all, registration of deaths may be considered practically complete. In this connection Table 1 shows for the several States the date of first enactment of a compulsory registration law, the proportion of population living in cities of over 10,000 population, the number of registry offices, and the average area and the average population served:

TABLE 1.—*Death registration in the registration States*

State	Year in which first compulsory death registration law was passed[a]	Year in which State was admitted to death-registration area	Local registrars			Urban population, cities of 10,000 and over, per cent of total: 1920[d]	Urban population, cities of 2,500 and over, per cent of total: 1920[c]
			Number[a]	Average area to each (square miles)[b]	Average population to each[a]		
California	1877	1906	350	444.7	9,791	57.1	68.0
Colorado	1876	1906	152	682.0	6,182	38.6	48.2
Connecticut	1848	1890	197	24.5	7,008	74.9	67.8
Delaware	1881	1890	30	65.5	7,433	49.4	54.2
District of Columbia	1874	1880				100.0	100.0
Florida	1899	1919	565	97.1	1,714	24.4	36.7
Georgia	1903	1922	1,092	53.8	2,652	18.0	25.1
Idaho	1907	1922	101	825.3	4,276	8.4	27.6
Illinois	1877	1918	1,417	39.6	4,577	58.7	67.9
Indiana	1881	1900	541	66.6	5,417	40.0	50.6
Iowa	1881	1923	812	68.5	2,961	25.1	36.4
Kansas	1885	1914	1,027	79.6	1,723	23.6	34.9
Kentucky	1851	1911	1,286	31.2	1,879	17.9	26.2
Louisiana	1855	1918	685	66.3	2,626	27.6	34.9
Maine	1875	1900	522	57.3	1,471	28.0	39.0
Maryland	1880	1906	431	23.1	3,363	56.2	60.0
Massachusetts	1842	1880	355	22.6	10,852	81.6	94.8
Michigan	1867	1900	1,722	33.4	2,130	51.6	61.1
Minnesota	1872	1910	2,664	30.4	896	34.6	44.1
Mississippi	1880	1919	N. R.			7.6	13.4
Missouri	1891	1911	1,033	66.5	3,295	39.8	46.6
Montana	1895	1910	152	961.4	3,611	21.4	31.3
Nebraska	1905	1920	512	150.0	2,532	21.8	31.3
New Hampshire	1849	1890	235	38.4	1,885	43.7	63.1
New Jersey	1848	1880	536	14.0	5,888	65.6	78.4
New York	1847	1890	1,325	36.0	7,838	78.0	82.7
North Carolina	1879	1916	1,460	33.4	1,753	12.1	19.2
Ohio	1867	1909	1,088	37.4	5,294	54.9	63.8
Oregon	1903	1918	213	448.9	3,678	38.4	49.9
Pennsylvania	1851	1906	N. R.			50.8	64.3
Rhode Island	1850–2	1890	39	27.4	15,497	83.0	97.5
South Carolina	1856	1916	450	67.8	3,742	10.3	17.5
Tennessee	1881	1917	974	42.8	2,400	19.2	26.1
Utah	1898	1910	N. R.			35.9	48.0
Vermont	1856	1890	249	36.6	1,415	13.5	31.2
Virginia	1852	1913	1,208	33.3	1,912	23.8	29.2
Washington	1889	1908	355	188.3	3,821	47.3	55.2
Wisconsin	1852	1908	1,723	32.1	1,528	36.6	47.3
Wyoming	1907	1922	48	2,032.3	4,050	13.0	29.5

[a] Data furnished by courtesy of vital-statistics division, U. S. Bureau of the Census.
[b] Fourteenth Census of the United States, 1920, Vol. I, Population, Table 14, p. 26.
[c] Ibid., Table 30, p. 46.
[d] Mortality Statistics, 1920, Table 1A, p. 74. U. S. Bureau of the Census.

[2] Desire to avoid the consequences of criminal acts, as in criminal abortion, etc., though a motive for failure to register such deaths, would affect deaths from violence, with which such deaths are classified, and not deaths from puerperal causes.

Deficiencies in death registration result in too favorable rates. If, then, the death rate is so low that it is improbable, it suggests that death registration is imperfect. A study of the death rates in the different cities and rural parts of counties in the death-registration area in 1920 shows that in 29 rural parts of counties the death rate was less than 5; in 2 counties in Colorado with a largely Mexican population and in 1 county in Utah not a single death was registered; in 1 city and 110 rural parts of counties the rate was between 5 and 7; in 5 cities and 127 rural parts of counties the rate was between 7 and 8; and in 11 cities and in 242 rural parts of counties the rate was between 8 and 9. Without a study of the age composition of the population and without taking account of the size of the community (in addition to which there is the danger of errors in estimates of population) it is difficult to say that a low rate in a particular community indicates deficient registration, yet it should be remembered that a crude death rate of 8 per 1,000 in an average population indicates roughly an average life span of about 65 years and that lower crude rates mean correspondingly longer expectation of life.[3]

No figure for the total number of omissions in the death-registration area is given because it is impossible to estimate it without having the true death rate. In any case the conclusion can be drawn that death registration is not complete but that a considerable number of deaths are omitted.

For the present purpose the omissions that have to be considered are those of deaths of women of childbearing age due to a particular cause. Except in areas where no deaths are registered, deaths from puerperal causes are probably more likely to be registered than are those from other causes, because cases of childbirth are more frequently attended by physicians than cases of ordinary sickness.

Faulty certification of causes.—Errors in the numbers of puerperal deaths may be due to faulty certification of causes. Most laws require the physician in attendance on the deceased to certify to the cause of death. In case no physician was in attendance the cause is either not given or stated by a coroner or examiner, who is usually, if not in all cases, a physician, or by some other person. Obviously the value of the certification depends upon the person making it; that is, whether he is qualified and in a position to know the facts, and whether he reports them faithfully.

Statistics showing the proportions of puerperal deaths in 1920 that were certified by physicians are given in Table 2 for eight selected States.[4]

In these States the proportions were found to vary from 100 per cent for Nebraska to 83 per cent for South Carolina. Unfortunately no figures are available to show the proportion of deaths of all women of childbearing ages that are certified by the attending physician.

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[3] "The ordinary or crude death rate of a State and its subdivisions * * * may be so low as of itself to arouse or strengthen the belief that not all the deaths are recorded In my opinion a death rate below 13 probably, and below 12 certainly, shifts the burden of proof. By that I mean that one is justified in doubting the accuracy of such a rate, unless the official responsible for it rebuts the presumption against it by showing that the age and sex composition of the population is unusually favorable to a low death rate or that all possible sources of error have been carefully considered. Thus in the registration States which are sparsely settled the lowest death rate occurs as a rule in the most sparsely settled countries (counties) where the obstacles to complete registration are most serious." Willcox, Walter F.: "Progress of vital statistics in the United States," pp. 15-16. Paper read at meeting of the International Statistical Institute, Belgium, 1924.

[4] Based upon a study of the transcripts of death certificates made for the Bureau of the Census.

TABLE 2.—*Proportion of deaths from puerperal causes certified by physicians in certain States, in cities of 10,000 population and over and in rural areas, 1920* [1]

State and area	Deaths from puerperal causes				
	Total	Certified by physicians		Certified by other persons or not certified	
		Number	Per cent	Number	Per cent
Maine	147	145	98.6	2	1.4
Cities	52	52	100.0		
Rural areas	95	93	97.9	[2] 2	2.1
Pennsylvania [3]	1,615	1,491	92.3	124	7.7
Cities	944	837	88.7	[4] 107	11.3
Rural areas	671	654	97.5	17	2.5
Michigan [5]	844	823	97.5	21	2.5
Cities [5]	486	466	95.9	[4] 20	4.1
Rural areas	358	357	99.7	1	.3
Nebraska	220	220	100.0		
Cities	69	69	100.0		
Rural areas	[6] 151	151	100.0		
Maryland	274	261	95.3	13	4.7
Cities	160	147	91.9	[7] 13	8.1
Rural areas	114	114	100.0		
South Carolina	579	482	83.2	97	16.8
Cities	80	79	98.8	1	1.2
Rural areas	499	403	80.8	[8] 96	19.2
Mississippi	478	446	93.3	32	6.7
Cities	72	72	100.0		
Rural areas	406	374	92.1	[9] 32	7.9
California [10]	514	480	93.4	34	6.6
Cities [10]	333	307	92.2	[4] 26	7.8
Rural areas	181	173	95.6	[11] 8	4.4

[1] It should be remembered that the evidence is based not upon the death certificates but upon transcripts from them made for and filed with the Bureau of the Census. The instructions for copying the records call for the name of the physician who signed the death certificate.
[2] Includes 1 signed by a registered nurse and 1 unsigned.
[3] Certificates for certain cities in Pennsylvania not available.
[4] Signed by coroner (not stated whether a physician).
[5] Exclusive of Battle Creek and Port Huron.
[6] Mortality Statistics, 1920, gives 152 deaths from puerperal causes in Nebraska. (One certificate not located.)
[7] Includes 11 signed by coroners and 2 unsigned.
[8] Includes 1 signed by coroner, 1 unsigned, and 94 with the entry "no physician."
[9] Includes 1 signed by registrar, 2 unknown, and 29 with the entry "no physician."
[10] Exclusive of Riverside City.
[11] Includes 7 signed by coroner and 1 unsigned.

Three types of faulty certification affect the statistics of causes of death published by the United States Bureau of the Census. In some cases no cause is given, or the cause is stated in such vague terms that it is meaningless and no additional information can be obtained, and the deaths are classified as from "ill-defined or unknown" causes. In other cases the causes are certified in terms which are not sufficiently full to insure their correct classification. For example, a final symptom is certified instead of the true cause of death, as when "convulsions" is stated instead of "puerperal albuminuria," or an essential qualifying term is omitted as when the entry

is "septicemia" instead of "puerperal septicemia." A third group that in practice is difficult to distinguish from the second comprises cases where the certification is erroneous either through failure or inability on the part of the attendant to diagnose correctly or through unwillingness to certify to the true cause. So far as failure to diagnose correctly is concerned, however, if the fact of pregnancy or childbirth as a complication in connection with the death is stated, the application of the rules of statistical preference will usually secure a correct [5] result, and the medical attendant can hardly fail to be aware of the puerperal condition in those cases in which it is a complicating factor in the death. Unwillingness to state the true cause may be due to a knowledge that the certificates become part of a public record and may be evidence, therefore, for possible criticism in cases of deaths from puerperal septicemia, which are frequently, though not invariably, due to carelessness on the part of the medical attendant. In such cases, however, if the death is registered as due to a noninfectious instead of an infectious puerperal cause, the erroneous return will not affect the total of deaths from puerperal causes.

Estimates of omissions due to faulty certification.—One method of estimating the number of omissions is from the evidence furnished in the statistics themselves. This evidence concerns the deaths from ill-defined or unknown causes, the statistics of the system of querying unsatisfactory returns, and the possible extent of transfers from puerperal to other important causes of death.

A small number of deaths of women of the childbearing ages are classified as from ill-defined or unknown causes; these, if full information were available, would be assigned to definite causes, and the puerperal group would receive its share. In 1920 in the United States death-registration States, deaths of women between 15 and 45 years of age from ill-defined or unknown causes numbered 987. Unfortunately, no specific evidence is available to indicate what proportion of these were puerperal; on the conservative assumption that the proportion was equal to the percentage that the known puerperal formed of the total deaths from known causes, 120 would have been added to the puerperal deaths in the registration States, an increase equal to seven-tenths of 1 per cent of the puerperal deaths.

Special efforts are made by the Census Bureau to reduce to a minimum the number of faultily certified causes. These efforts include the distribution of pamphlets to physicians explaining the purposes of certification and giving cautions against the use of vague and unsatisfactory terms;[6] the education of local registrars to call for more satisfactory and complete records; [7] and the sending to the physicians of letters of inquiry regarding the unsatisfactorily certified causes of specific deaths.[8] The effectiveness of these measures is

[5] Correct from the point of view of the statistical office.
[6] Mortality Statistics, 1912, p. 23. U. S. Bureau of the Census.
[7] Ibid., 1907, p. 80; ibid., 1914, p. 34.
[8] The report on Mortality Statistics for 1907 mentions (p. 76) that lists of cases of deaths from violence were sent to State and city registrars with the request that additional information be secured if possible. The report for 1911 gives (p. 37) the results of sending circular letters asking for more information in regard to deaths certified as from meningitis, paralysis, convulsions, pneumonia, and peritonitis. Since 1914 this procedure has been made routine, and the list of causes queried has been extended from time to time. In the report for 1917 mention is made of the fact that letters of inquiry were sent out from certain of the State offices (1914, p. 35; 1917, p. 65), a practice, however, which many State offices already followed as a matter of routine. See also Maternal Mortality from All Conditions Connected with Childbirth in the United States and Certain Other Countries, by Grace L. Meigs, M. D , p. 39 (U. S. Children's Bureau Publication No. 19, Washington, 1917).

evidenced by a decrease in the proportion of deaths in the registration States from ill-defined and unknown causes from 3.8 per cent in 1900 to 0.2 per cent in the same States in 1920.[9]

The scope of the system of querying unsatisfactory causes of death is indicated by the fact that 50,000 letters were sent out directly by the Bureau of the Census to physicians in 1916, 43,876 in 1917, 42,549 in 1920, and 35,145 in 1921, concerning 5, 4.1, 3.7, and 3.4 per cent of the deaths in those years, respectively.[10] These figures do not include the many letters sent out by special agents of the bureau beginning in 1917, nor do they include the letters sent by State registrars. The proportion of replies received in answer to the letters sent by the Census Bureau and the changes resulting are shown in Table 3. The list of causes queried, so far as those terms are concerned under which deaths from puerperal causes might be returned, include septicemia, convulsions, hemorrhage, peritonitis, Bright's disease, nephritis, uremia, salpingitis, and related terms.

Table 4 shows the results of these letters of inquiry. In 1921 the net additions to deaths from puerperal septicemia numbered 148 (2.4 per cent of the total), and the net additions to deaths from puerperal albuminuria and convulsions numbered 160 (4 per cent). To the extent to which these inquiries are successful in eliciting correct statements of cause the published figures of deaths from puerperal causes are corrected by the additional information secured.

A considerable proportion of the letters are never answered. In 1921 no replies were received to 37.9 per cent of the inquiries. On the assumption that if these had been answered they would have resulted in the same proportion of additions to deaths from puerperal causes as did result from those to which replies were received, 187 more would have been added to the deaths from puerperal causes, representing an increase of 1.2 per cent. This figure may be regarded as a minimum number of additions, since even in cases in which replies were received they may have failed to give the full information necessary for correct classification.

TABLE 3.—*Scope and effect of system of querying deaths certified in vague and unsatisfactory terms; United States death-registration area, 1914 to 1921* [a]

Year	Total deaths	Replies received		Changes made		
		Number	Per cent of total deaths	Number	Per cent of replies received	Per cent of total deaths
1914	898,059	7,527	0.8	3,461	46.0	0.4
1915	909,155	19,092	2.1	7,484	39.2	.8
1916	1,001,921	37,802	3.8	19,267	51.0	1.9
1917	1,066,711	[b] 32,702	3.1	17,171	52.5	1.6
1918	1,445,158	16,393	1.1	8,183	49.9	.6
1919	1,096,436	[c] 23,287	2.1	11,248	48.3	1.0
1920	1,142,558	[d] 23,925	2.1	11,501	48.1	1.0
1921	1,032,009	[e] 21,816	2.1	9,047	41.5	.9

[a] Mortality Statistics, 1914–1921. U. S. Bureau of the Census.
[b] 74.5 per cent of total queries.
[c] 57.3 per cent of total queries.
[d] 56.2 per cent of total queries.
[e] 62.1 per cent of total queries.

[9] Compiled from Mortality Statistics, 1900, pp. 40–41, and ibid., 1920, pp. 308–478. The variations in the proportion of deaths from ill-defined and unknown causes in the different States in 1921 is given in General Table 4, p. 145.
[10] Mortality Statistics, 1917, p. ;65 ibid., 1921, p. 98.

TABLE 4.—*Total deaths from puerperal causes and number and percentage added as result of investigation; United States death-registration area, 1911–1921*

Year	Total puerperal deaths	Number of causes queried	Number of replies received	Changes in classification	
				Number	Per cent
1911	9,456	(1)	(1)	(1)	(1)
1914	10,518	(1)	7,527	3,461	46.0
1915	10,237	(1)	19,092	7,484	39.2
1916	11,642	(1)	37,802	19,267	51.0
1917	12,528	43,876	32,702	17,171	52.5
1918	18,177	(1)	16,393	8,183	49.9
1919	14,488	40,608	23,287	11,248	48.3
1920	16,776	42,549	23,925	11,501	48.1
1921	15,027	35,145	21,816	9,047	41.5

Year	Puerperal septicemia			Puerperal albuminuria and convulsions			All other		
	Total	Cases added		Total	Cases added		Total	Cases added	
		Number	Per cent		Number	Per cent		Number	Per cent
1911	4,376	[2] 8	0.2	2,094	[3] 12	0.6	2,986	(1)	(1)
1914	4,664	[4] 64	1.4	2,617	[4] 24	.9	3,237	(1)	(1)
1915	4,214	[4] 84	2.0	2,673	[4] 48	1.8	3,350	(1)	(1)
1916	4,786	66	1.4	3,087	106	3.4	3,769	(1)	(1)
1917	5,211	182	3.5	3,409	168	4.9	3,908	28	0.7
1918	5,250	(1)	(1)	3,651	(1)	(1)	9,276	(1)	(1)
1919	4,950	126	2.6	3,592	133	3.7	5,946	(1)	(1)
1920	5,800	133	2.3	4,246	146	3.4	6,730	(1)	(1)
1921	6,057	148	2.4	4,032	160	4.0	4,938	(1)	(1)

[1] Figures not reported. For 1916 the number of causes queried was approximately 50,000.
[2] Out of 102 cases of "peritonitis" investigated.
[3] Out of 268 cases of convulsions investigated.
[4] Number estimated.

The third source of evidence regarding possible omission of puerperal deaths is in the sex distribution of deaths from those causes to which transfers might have been made. For example, if any considerable number of deaths from puerperal causes were classified as due to nephritis, peritonitis, or Bright's disease because they were either incompletely or erroneously certified, their transfer would result in an unusual preponderance of female deaths at the childbearing ages. By comparing, therefore, the death rates, or more simply the number of deaths from these diseases of males and females at different ages it could easily be ascertained whether any considerable number of transfers could have occurred.[11]

In Table 5 the relative numbers of deaths of males and females under 15, from 15 to 49, and 50 and over are compared for peritonitis, acute nephritis, and Bright's disease in the registration States in 1920. In each case a marked excess is found of female deaths during the childbearing ages. At ages 15 to 49 the number of deaths from peritonitis among females was over twice that among males, under 15 the numbers were practically equal, and over 50 the male deaths were in the majority. From nephritis the ratio of female to male deaths at ages under 15 was 80, at ages 15 to 49 it was 106, and at ages 50

[11] Supplement to the Seventy-Fifth Annual Report of the Registrar-General of England and Wales, Part III, by T. H. C. Stevenson, p. liii. Cd. 8002. Ehlers, Philipp: Die Sterblichkeit "im Kindbett" in Berlin und Preussen, 1877–1896, pp. 55–84. Stuttgart, 1900.

and over it was 80 to every 100 deaths of males in the corresponding age groups. From Bright's disease the ratio of female to male deaths shifted from practical equality under 15 (99 female to 100 male) to a marked excess for females at ages 15 to 49 (113 female to 100 male) and back to a marked excess for males at ages 50 and over (83 female to 100 male).

TABLE 5.—*Relative mortality of males and females from peritonitis, acute nephritis, and Bright's disease, by age groups; United States death-registration States, 1920* [1]

Age	Deaths from—								
	Peritonitis			Acute nephritis			Bright's disease		
	Males	Females	Ratio [2]	Males	Females	Ratio [2]	Males	Females	Ratio [2]
Total	668	886	133	2,878	2,572	89	37,845	33,115	88
Under 15	217	218	100	706	563	80	513	507	99
15–49	230	482	210	999	1,063	106	5,730	6,494	113
50 and over	219	186	85	1,166	938	80	31,542	26,071	83
Unknown	2			7	8		60	43	

[1] Mortality Statistics, 1920, pp. 278–279. U. S. Bureau of the Census. (The District of Columbia is included in the registration States.)
[2] Females to 100 males. Not shown for unknown ages.

No such marked changes in the ratios of male to female deaths are found, however, for appendicitis or typhoid fever, which are sometimes mentioned as terms under which puerperal septicemia is concealed. The changes in the ratios of male and female deaths at different ages from peritonitis, nephritis, and Bright's disease suggest that transfers are made from puerperal to other causes and that, as a result, the recorded mortality from puerperal causes falls considerably short of the true mortality.

Assuming that these changes in the relative ratios of male to female deaths at the childbearing ages are due to transfers of deaths from other causes, the number of such transfers may be estimated as follows: If the deaths from peritonitis of females between 15 and 50 years of age had actually been no more numerous than those of males, 252 deaths attributed to that cause must have been due to something else, many of them probably to puerperal causes. If the ratio of 80 female to 100 male deaths from nephritis that prevailed at ages over 50 and at ages under 15 is assumed to express the true ratio for ages 15 to 49, the number of transfers, doubtless mainly of puerperal deaths, to this cause is found to have been 264; and if the true ratio of female to male deaths from Bright's disease at ages 15 to 49 is assumed to be 91 to 100 (an average between the ratio of 99 to 100 at ages under 15 and that of 83 to 100 at ages over 50), the excess of female deaths from this cause is estimated at 1,280. From all these estimates it appears that a total of 1,796 represents, on the assumption stated, the deaths transferred to these three causes. This figure is equal to 11 per cent of the deaths from puerperal causes.

Though this method of approach suggests that transfers from puerperal to other diseases may be frequent, the difficulty of proving

the validity of the assumption precludes an accurate estimate of the understatement of puerperal deaths due to such transfers. On the one hand, in the material relating to the three diseases already discussed no distinction can be made between transfer of deaths because of incorrect or faulty certification and an actual change in the ratio of male and female deaths for the ages under consideration as compared with other ages. Such an increase in the number of female as compared with male deaths from peritonitis, for example, might be due to or result from gynecological operations, and in the case of nephritis or Bright's disease might be due to a real change in the incidence of mortality by sex; such changes are doubtless connected directly or indirectly with sex differences if not specifically with the childbearing function. On the other hand, the calculation leaves out of account those causes peculiar to the female sex to which transfers from puerperal causes might have been made but to which this method of estimate is inapplicable. For example, deaths from puerperal causes may be incorrectly reported and classified as due to "salpingitis." [12]

Another method of testing the number of omissions of deaths from puerperal causes is to check the deaths of women of the childbearing ages with birth certificates in order to discover not only whether childbirth was a complication in the death but especially whether in any considerable proportion of cases failure to mention childbirth as a complication resulted in erroneous classification. Such a check is of course dependent upon complete registration and is inapplicable, furthermore, in those cases where death occurs during pregnancy and without a miscarriage, a stillbirth, or a birth having occurred. Such a test was carried out in four States. All the death certificates for women between 15 and 50 years of age [13] were compared with the birth certificates; and if a birth had occurred to the deceased within two months before her death that fact was noted on the death certificate. All the cases in which this check resulted in additional information, either by adding the fact of childbirth as a complication in the death or by adding new evidence that might affect the decision as to whether childbirth or another cause should have been preferred, were submitted to the Bureau of the Census for its rulings.[14]

In addition to this check by matching the death with birth certificates a second check was made in three States by matching State death certificates with the Census Bureau transcripts and by verifying, in doubtful cases, the classification of causes made for purposes of tabulation with a second classification of the same causes or combinations of causes.

The net result of these checks was to indicate that the number of deaths classified as due to puerperal causes fell short of the true number by about 12 per cent in Maryland and Wisconsin, 13 per cent in Massachusetts, and 30 per cent in North Carolina.

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[12] The total number of deaths in 1920 in the death-registration States from causes classified under the rubric "salpingitis and other diseases of the female genital organs" was 1,569.

[13] In North Carolina between 13 and 50 years of age.

[14] These rulings are necessarily based upon the information available; if additional data had been on hand the final classification might have been different. Furthermore, if the physician in attendance reports the death of a woman during pregnancy or shortly after childbirth and states explicitly that the pregnancy or childbirth was not a cause of her death, his statement in most cases would be accepted. The results of these tests, therefore, may slightly overstate the true number of puerperal deaths.

Reference should be made to the study of the accuracy of reporting maternal deaths in Wisconsin in 1915 by Dr. Dorothy Reed Mendenhall.[15] Letters were sent to physicians reporting deaths in which puerperal conditions were suspected to have been a factor, and the health officers in the 20 largest cities in the State were requested to check names of women between 15 and 50 years of age who died in 1915 with certificates of births in 1915 to see if any of these women had borne a child during the month before her death. As a result of these means "38 cases of deaths among women in 1915 accompanying the puerperal state, not appearing clearly as such on the death certificate," were found. This figure is 11.9 per cent of the 318 deaths originally classified as from puerperal causes.

Statistical errors.—Under statistical errors may be included errors of classification, transcribing, tabulation, and printing. Uniformity of classification in accordance with the International List of Causes of Death is secured by having all causes classified in a single office (the U. S. Bureau of the Census) and by means of definite printed rules.[16] The correctness of the final classification depends not only upon the certification of cause in full and correct terms, a point which has already been discussed, but also upon the accuracy of the work of classification in the statistical office. So far as the second point is concerned it may be noted that the work is performed by clerks who have had special training in classification of cause of death, and the entire work of tabulation is conducted by an office in which every effort is made to reduce statistical errors to a minimum.

Registration of births.

Since the calculation of puerperal mortality rates in terms of live births is limited to the United States birth-registration area, in which the registration of births must have been sufficiently complete (90 per cent) to pass the tests of the Bureau of the Census for admission to the area, the error due to the omissions of births is presumably less than 10 per cent.

The maternal mortality rate is overstated in the same degree that the registered births fall short of the true numbers. To throw light upon the completeness of birth registration, the laws in force in the different States, the methods of enforcement, the familiarity of the population with the law, and the motives for evasion must be briefly considered. The duty of registration in most laws is placed, first, upon the attendant at the birth, and, secondarily, if no attendant was present, upon the father and mother of the child. Since there is no easy method of control over birth registration as there is over death registration, the completeness with which births are recorded depends directly upon the cooperation of physicians and midwives with the registrars and upon popular support of the law. Prosecution of physicians and other attendants who fail to register births is an effective method of enforcement, especially if the cases are given wide publicity. The issue of special certificates to parents showing that the birth of their child has been registered is another method that has been growing in favor in recent years, since if the parents

[15] Mendenhall, Dorothy Reed, M. D.: Prenatal and Natal Conditions in Wisconsin. Reprint from Wisconsin Medical Journal, Vol. XV, No. 10 (March, 1917), pp. 9–10.

[16] Published in the Manual of the International List of Causes of Death and in the Manual of Joint Causes of Death. See pp. 3, 103–111.

are educated to demand these certificates, they quickly bring to the attention of the registrars any cases of failure to register on the part of the attendant. Practically the only motives for evasion of the law requiring registration of birth are desire to shield the mother of an illegitimate infant and unwillingness to take the trouble to register. A device frequently used to lessen the unwillingness to take the trouble is the payment of a small fee for the registration of each birth.

Evidence available to indicate the proportion of unregistered births is rather incomplete. Tests of birth registration in 1916 were made by the Bureau of the Census in the six New England States. The preliminary results indicated that registration was less than 90 per cent complete in two of these States.[17]

These tests consisted of a comparison of deaths in 1916 of infants under 1 year of age who had been born in the State during the same year with the list of registered births, the percentage of cases for which no birth certificate was found being used to indicate the proportion of unregistered births. This percentage would probably tend to overstate this proportion, since cases in which a death could not be identified with a registered birth for any reason (such as variations in spelling of the names, insufficient identification in the birth certificate, removal from place to place in the State) would all be counted as if the birth had not been registered. The Census Bureau did not consider these tests final, but in the two States having percentages of less than 90 other tests were made to determine whether or not the State should be dropped from the birth-registration area.

In the course of studies of infant mortality in selected cities the Children's Bureau tested the completeness of birth registration at the time these studies were made. In Waterbury, Conn., for the period June 1, 1913, to May 31, 1914, the results of a house-to-house canvass showed that at least 12.8 per cent of the live births had not been registered.[18] The greatest number of omissions were found among certain foreign-born nationalities. In interpreting these results for a single city it must be remembered, of course, that they may not be typical of the State. Though official figures for the birth-registration area were not regularly published until 1915, nevertheless Connecticut was included among the States in the provisional birth-registration area in 1910 [19] and was one in which a compulsory birth registration law had been in force for many years.

Another means of checking the completeness of birth registration is by comparison with the census enumeration of the infant population. For example, the births registered in 1919 less the deaths before December 31 of infants born in that year should equal, leaving migration out of account, the infant population under 1 year of age on January 1, 1920, the date to which the census referred. Such a comparison encounters special difficulties not only in calculating errors of omission and overstatements of age in the census returns but

[17] See Birth Statistics, 1916, p. 19 (U. S. Bureau of the Census). Percentages of births for which no birth certificates were found in the six States were as follows: Connecticut, 15.2; Maine, 9.5; Massachusetts, 8.7; New Hampshire, 5.6; Rhode Island, 18.3; and Vermont, 5.7.

[18] Infant Mortality; results of a field study in Waterbury, Conn., based on births in one year, by Estelle B. Hunter, p. 20. U. S. Children's Bureau Publication No. 29. Washington, 1918.

[19] Mortality Statistics, 1911, p. 26.

also of estimating deaths in 1919 of infants born in the same year. Nevertheless, this method will be examined since it affords almost the only means of estimating the proportion of unregistered births in the registration area.

The result of comparing the numbers of births actually registered during 1919 with the estimated number of births is presented in Table 6 as an estimate of unregistered births.

The estimated births in Table 6 are each the sum of three items: (1) 72 per cent of the male and 71 per cent of the female deaths under 1 year of age in 1919, as an estimate of the number of deaths under 1 year of infants who were born in 1919;[20] (2) the population under 1 year of age as enumerated January 1, 1920;[21] and (3) an estimate for the underenumeration of the infant population arising because of errors of age, omissions, or other causes. This estimate was calculated on the assumption that the underenumeration of the white infant population was 9 per cent, that of the negro infant population was 19 per cent, and that of the "other colored" infant population was 30 per cent.

The estimate for underenumeration of the white infant population was based partly upon the results of a careful check of birth records and census schedules for the District of Columbia, from which it appeared that omissions of the white infants equaled 9 per cent of the enumerated population [22] and partly upon the results of comparing the population under 1 year of age, as estimated from the registered births, with the enumerated population in New York and Massachusetts (these two States had apparently the best birth registration). In these States, assuming that birth registration was complete, the estimated understatement of the infant population was 9.7 per cent in each State.

The estimate for the underenumeration of the negro infant population was based upon the results of a comparison of the estimated negro population under 1 year of age with the enumerated population in Maryland (of the States having considerable negro population Maryland, according to the test of registration for white births, had the best birth registration). In estimating the negro infant population it was assumed that in Maryland the same proportion of negro births as of white births were unregistered and that the estimate of the omission of white births on the basis given in the preceding paragraph is approximately correct. On these assumptions the proportion of omissions from the census of negro infants was calculated as 19 per cent, a figure substantially greater than that of omissions of white infants. It seems probable that this figure is an understatement rather than an overstatement, from the fact that the check of birth records with the names of infants listed on the census schedules for the District of Columbia showed an even larger proportion of omissions in case of the negro infant population [23] and from the fact that the assumption that the registration of negro births is as complete as that of the whites, though borne out by the study of the birth

[20] Based upon figures for Germany cited in United States Life Tables, 1890, 1901, 1910, 1901–1910, p. 340 (U. S. Bureau of the Census).

[21] Including its due proportion of the persons of unknown ages.

[22] See United States Abridged Life Tables, 1919–20, by Elbertie Foudray, p. 9 (U. S. Bureau of the Census, Washington, 1923).

[23] Ibid., p. 9. It should be noted that this estimate of 19 per cent is somewhat more conservative than the figure 25 per cent used in calculating the estimated births for the Abridged Life Tables issued by the Bureau of the Census.

records in the District, is probably too favorable to the status of the birth registration among the negroes in Maryland, judging from the evidence for other States of the birth-registration area.

The estimate for omissions of "other colored" is based upon the following considerations: The "other colored" are principally Japanese in California, Washington, and Oregon, and principally Indian in other States. In California, upon the assumption that the registration of "other colored" is subject to the same error as that estimated to characterize registration of white births, the estimated infant population is calculated from this corrected figure for births and the figure for deaths among the infants born prior to the date of the census; the comparison of the estimated with the enumerated population indicates that the omissions equaled 39.8 per cent of the enumerated population. Even if birth registration of the "other colored" had been assumed perfect the omissions would have equaled 24.7 per cent; therefore, as a conservative compromise between these two values, 30 per cent is assumed as the proportion of unregistered births [24] for "other colored."

TABLE 6.—*Estimated deficiency in birth registration, by States; United States birth-registration area, 1919* [1]

State	Estimated births, 1919	Registered births, 1919	Deficiency of registered births		Estimated per cent of births omitted [3]
			Number	Per cent [2]	
Birth-registration area	1,491,199	1,373,438	[4] 119,078	8.7	8.0
California	62,687	56,528	6,159	10.9	9.8
Connecticut	34,984	33,912	1,072	3.2	3.1
Indiana	63,900	59,286	4,614	7.8	7.2
Kansas	41,547	36,373	5,174	14.2	12.5
Kentucky	67,292	57,737	9,555	16.5	14.2
Maine	17,058	15,496	1,562	10.1	9.2
Maryland	35,710	33,972	1,738	5.1	4.9
Massachusetts	87,338	87,709	[5] 371	[5] .4	
Michigan	89,845	83,910	5,935	7.1	6.6
Minnesota	56,135	51,942	4,193	8.1	7.5
New Hampshire	9,237	8,778	459	5.2	5.0
New York	225,469	226,108	[5] 639	[5] .3	
North Carolina	85,310	73,854	11,456	15.5	13.4
Ohio	129,660	113,054	16,606	14.7	12.8
Oregon	15,518	13,540	1,978	14.6	12.7
Pennsylvania	228,988	207,685	21,303	10.3	9.3
South Carolina	55,306	44,624	10,682	23.9	19.3
Utah	13,864	13,040	824	6.3	5.9
Vermont	7,604	7,032	572	8.1	7.5
Virginia	66,356	60,785	5,571	9.2	8.4
Washington	28,338	25,112	3,226	12.8	11.4
Wisconsin	61,180	54,781	6,399	11.7	10.5
District of Columbia	7,873	8,180	[5] 307	[5] 3.8	

[1] For method of computation see pp. 18–19.
[2] Calculated by dividing deficiency by the registered births.
[3] Calculated by dividing deficiency by the estimated births.
[4] Excludes States showing an excess of registered births.
[5] Excess of registered births.

The result of this calculation gives 8.7 per cent as the proportion that the omitted births bore to the registered births in 1919. This proportion, on the assumptions stated in describing the method of estimate, varied from zero for Massachusetts, New York, and the District of Columbia to 23.9 per cent for South Carolina.

[24] No estimate of the omissions from the census enumeration of "other colored" was made for the United States Abridged Life Tables.

As to whether this estimate gives too favorable or too unfavorable a picture of birth registration the following points may be noted: In New York evidence from State tests indicates that births are more completely registered in cities than in rural districts. It seems probable, therefore, that the number of registered births in New York State falls somewhat short of the true number of births and that the factor for correction of the enumerated infant population calculated on the assumption that birth registration was complete is too small rather than too large. The test made in the District of Columbia showed that 4.5 per cent of the births were actually unregistered, although in the estimate registration in the District was considered complete. Furthermore, the assumption that registration of negro births in Maryland was 95 per cent complete (that is, equal to the percentage calculated for white births) is probably too favorable. There is no reason to suppose that census enumeration in New York and Massachusetts, Maryland and California was worse than average or that the selection of these States as a basis for calculating a "factor of correction" would have tended to inflate the estimate of unregistered births. It seems probable, therefore, that the estimate tends to err, if it errs at all, on the side of being too favorable to birth registration. Nevertheless, it should be borne in mind that these figures are merely estimates and subject to a very considerable margin of error.[25]

Net error of the maternal mortality rate.

The survey of the omissions from the deaths from puerperal causes has led to the conclusion that probably the deaths fell short of the true number by as much as 12 per cent; a survey of the omissions from the registered live births has led to the conclusion that these births fell short of the true number by 8.7 per cent, and therefore fell short of the number of confinements by about 12 per cent. (See p. 5.) Because of the omission of not far from equal proportions from both numerator and denominator of the fraction which gives the maternal mortality rate, the conclusion is perhaps justified that the maternal mortality rate for the birth-registration area as a whole as calculated by dividing the number of registered deaths classified as puerperal by the registered live births is probably not far from correct.

Since in the different States the proportion of omissions of births probably varies much more than does the proportion of omissions of puerperal deaths, the rates calculated upon registered births do not give exactly comparable figures of maternal mortality. Table 7, which is based upon the assumptions that in each State the proportion of puerperal deaths omitted is 12 per cent [26] and that the proportion of live births omitted is correctly given by the percentages in Table 6, shows mortality rates in the several States after correction for variations in accuracy of the basic data.

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[25] Additional evidence was obtained by correspondence with the State registrars of vital statistics, extracts from which are given in Appendix B. The estimates of completeness of registration made by the State registrars, which were based in part upon tests such as that of checking infant deaths with births, were somewhat higher than the percentages given in the table, but most of these estimates related to years subsequent to 1919; in one or two cases practically perfect registration was claimed. Nevertheless, in spite of the divergences from estimates made by the State officials, the method described in the text has been presented, since it affords a method of estimate upon a uniform basis applicable to all the States in the area.

[26] For exceptions see General Table 11, footnote 2, p. 155.

TABLE 7.—*Maternal mortality rates adjusted for estimated omissions of births and puerperal deaths compared with unadjusted figures; United States birth-registration States, 1919* [1]

State	Maternal mortality rates		State	Maternal mortality rates	
	Unadjusted	Adjusted		Unadjusted	Adjusted
Birth-registration area	7.4	7.7	New York	6.2	7.0
California	8.0	8.1	North Carolina	9.3	10.4
Connecticut	6.2	6.7	Ohio	7.4	7.2
Indiana	8.4	8.7	Oregon	10.1	9.9
Kansas	8.2	8.1	Pennsylvania	6.8	6.9
Kentucky	6.3	6.1	South Carolina	11.2	11.7
Maine	8.6	8.7	Utah	8.4	8.8
Maryland	8.4	8.9	Vermont	8.0	8.3
Massachusetts	7.1	8.0	Virginia	8.2	8.5
Michigan	7.7	8.1	Washington	8.6	8.5
Minnesota	6.7	7.0	Wisconsin	4.8	4.8
New Hampshire	8.0	8.4	District of Columbia	8.5	9.5

[1] For estimated births and estimated puerperal deaths, see General Table 11, p. 155.

PATHOLOGICAL CAUSES OF PUERPERAL MORTALITY

The pathological causes of puerperal deaths are classified in the International List of Causes of Death under eight groups. These are: (1) Accidents of pregnancy, a group which includes, for example, abortion (if not criminal) or miscarriage, tubal or ectopic pregnancy, and persistent vomiting of pregnancy; (2) puerperal hemorrhage, including placenta praevia and premature separation of placenta; (3) other accidents of labor, including, for example, difficult labor, faulty presentation, Cesarean section; (4) puerperal septicemia; (5) puerperal phlegmasia alba dolens, embolus, sudden death; (6) puerperal albuminuria and convulsions; (7) deaths following childbirth not otherwise defined, including those from puerperal insanity; and (8) puerperal diseases of the breast.[1]

PRIMARY CAUSES

Puerperal septicemia was the most important single cause, and contributed two-fifths of the total deaths for causes connected with pregnancy or childbirth, according to the figures for the death-registration area in 1921. (Table 8.) In interpreting this proportion the difficulty of obtaining a full statement of the deaths from puerperal septicemia must be borne in mind; on the other hand, special efforts are made in querying unsatisfactory statements of causes to obtain the true numbers. If two or more puerperal causes are stated on the death certificate, puerperal septicemia is preferred to any other. Among other causes "puerperal albuminuria and convulsions" was most important, contributing over one-fourth of these deaths. "Accidents of pregnancy," "puerperal hemorrhage," and "other accidents of labor," each contributed not far from one-tenth of the total "maternal deaths."

TABLE 8.—*Causes of puerperal deaths; United States death-registration area, 1921* [a]

Cause of death	Deaths from puerperal causes	
	Number	Per cent distribution
Total	15,027	100.0
Accidents of preguancy	1,258	8.4
Abortion	505	3.4
Ectopic gestation	465	3.1
Others under this title	288	1.9
Puerperal hemorrhage	1,533	10.2
Other accidents of labor	1,507	10.0
Cesarean section	247	1.6
Other surgical operations and instrumental delivery	170	1.1
Others under this title	1,090	7.3
Puerperal septicemia	6,057	40.3
Puerperal albuminuria and convulsions	4,032	26.8
Puerperal phlegmasia alba dolens, embolus, sudden death	550	3.7
Following childbirth (not otherwise defined)	85	.6
Puerperal diseases of the breast	5	(b)

[a] Mortality Statistics, 1921, p. 5. U. S. Bureau of the Census.
[b] Less than one-tenth of 1 per cent.

[1] For details of the titles included in each group see Appendix A, p. 103.

In general the classification into "puerperal septicemia" and "other puerperal causes" permits ready discussion of two broad groups and will be followed throughout the report, especially in those sections where comparisons are made between the rates in different countries.

CONTRIBUTORY CAUSES

Statistics showing the contributory causes of puerperal deaths in the death-registration area are available only for 1917. In Table 9 figures are given showing the deaths classified as due to causes connected with childbirth in which some other cause was also a contributing factor. These deaths constituted nearly one-fifth (18.7 per cent) of all those grouped as puerperal. Pneumonia and heart affections were complications in nearly one-fourth of all cases reported with contributory causes. Table 9 shows also that besides these non-puerperal complications, other puerperal causes than those to which the deaths were attributed were contributory to the deaths in an even larger proportion of cases (20.8 per cent). Of these causes "accidents of pregnancy" were most important, contributing to one-seventh of all puerperal deaths. Puerperal septicemia was not classified as a contributory cause in a single case, a result due, of course, to the fact that it was given preference whenever it appeared in combination simply with another puerperal cause.

TABLE 9.—*Contributory causes of puerperal deaths; United States death-registration area, 1917* [1]

Contributory cause of death	Deaths from puerperal causes, 1917		Contributory cause of death	Deaths from puerperal causes, 1917	
	Number	Per cent distribution		Number	Per cent distribution
Total puerperal deaths	12,528	100.0	With contributory puerperal causes	2,600	20.8
With contributory causes, exclusive of contributory puerperal causes	2,343	18.7	Accidents of pregnancy	1,796	14.3
			Puerperal hemorrhage	253	2.0
			Other accidents of labor	199	1.6
Influenza	44	.4	Puerperal septicemia		
Anemia, chlorosis	98	.8	Puerperal albuminuria and convulsions	171	1.4
Cerebral hemorrhage	57	.5			
Acute endocarditis	149	1.2	Puerperal phlegmasia alba dolens, embolus, sudden death	167	1.3
Organic diseases, heart	362	2.9			
Broncho pneumonia	83	.7			
Pneumonia (total)	509	4.1	Following childbirth (not otherwise defined)	8	.1
Lobar pneumonia	320	2.6			
Pneumonia (undefined)	189	1.5	Puerperal diseases of the breast	6	[2]
Pulmonary congestion	112	.9			
Appendicitis	47	.4			
Intestinal obstruction	65	.5			
Bright's disease	44	.4			
Salpingitis and other diseases of the female genital organs	122	1.0			
All other	651	5.2			

[1] Compiled from Mortality Statistics, 1918, pp. 50–91.
[2] Less than one-tenth of 1 per cent.

FACTORS IN PUERPERAL MORTALITY

The risk of death from the specific causes discussed in the preceding section may vary, of course, with other circumstances, such as the state of pregnancy, whether it resulted in a premature or still birth or in a live birth at term, whether the pregnancy and delivery were normal or attended with complications, whether any operation was performed in connection with delivery, the time that has elapsed since the birth, whether a single infant or twins or triplets were born, the age of the mother, the order of birth, and other factors. The evidence as to the influence of these factors over puerperal mortality is considered in this section.

In addition to the variations in mortality due to differences in risk here discussed, other variations are due undoubtedly to differences in the amount and quality of medical and nursing services availed of by the mother.[1] That these differences exist is easy to prove, though to bring statistical evidence of their exact influence over puerperal mortality or morbidity is rendered difficult by the tendency of mothers who experience ill health during pregnancy or who know they are threatened with complications to secure the best services available. In case of complications expert medical assistance is obviously the only means of lessening the risk of death. For example, the discovery that aseptic methods are necessary to prevent puerperal septicemia makes it clear that only the practice of asepsis by the medical attendant or by the midwife will greatly reduce the mortality rate from this disease. Striking evidence of the effect of increases in medical skill and knowledge of how best to meet various pathological conditions is given later in the report (see pp. 64–73) in considering evidence for the preventability of maternal mortality.

Though certain groups, such as the various nationality and race groups, differ in their rates of puerperal mortality, the evidence is not sufficient to prove whether these variations are due to differences in risk or to differences in medical and nursing services. Such variations may be influenced or caused by differences in the mothers' ages or in the order of birth or in the prevalence of conditions favorable or unfavorable to a low puerperal mortality. Differences between urban and rural rates in particular are doubtless to be explained in large part in terms of other factors than differences in the true risk of mortality of the rural and urban populations. These questions will be discussed in more detail in the sections dealing with these factors.

STAGE OF PREGNANCY OR PERIOD OF GESTATION

Only meager data are available to show changes in the risk of death as pregnancy advances, but some light can be thrown upon this question by a study of the several causes of death.

[1] See discussion by Dr. William Travis Howard, jr., "The real risk—rate of deaths to mothers from causes connected with childbirth," in American Journal of Hygiene, vol. 1, pp. 217–220 (March, 1921).

To the early months of pregnancy must be assigned deaths resulting from tubal pregnancy or ectopic gestation, those due to uncontrollable vomiting, and those due to the consequences of abortions and miscarriages. In the statistics these causes are not so classified that they can be added. For example, deaths resulting from puerperal septicemia following abortion are classified as due to septicemia; deaths following self-induced abortions, the increased mortality attending which should not be considered part of the "risk of death" to which expectant mothers are exposed, are included with those following abortions due to natural causes.[2] Deaths from puerperal albuminuria and convulsions and from certain other causes occur in the great majority of cases during the later months of pregnancy before confinement.

Deaths resulting from difficulty of labor due to contracted pelvis or following Cesarean section occur only when pregnancy has advanced to or nearly to full term. Deaths from puerperal septicemia, from puerperal hemorrhage, from puerperal phlegmasia alba dolens, or embolus, from puerperal mania, and from puerperal diseases of the breast, all follow the termination of pregnancy, but the statistics do not indicate whether they resulted from abortion or miscarriage, premature birth, or birth at term, and, therefore, do not show at what stage of pregnancy they occurred. If data were available an analysis could be made to show whether the risk of death from puerperal sepsis, for example, varies with the period at which the pregnancy is terminated.[3]

Data relating to deaths of mothers within three months after childbirth obtained in connection with a study of infant mortality in Baltimore permit a classification showing the variation in the risk of death in three periods of pregnancy. According to Table 10, the mortality rate of mothers in cases of confinements which resulted in miscarriages before the end of the seventh month was 26.8 per 1,000, as compared with 23.5 in cases of confinements which resulted in premature stillbirths of at least seven months' gestation or in premature live births, and with 3.9 in cases of confinements at term. In interpreting these figures it should be mentioned that since the basis of the study in Baltimore was births, deaths of mothers in the early months of pregnancy and in cases in which no births were registered were probably omitted; on the other hand, it is probable that many other pregnancies which terminated in these early months were omitted.

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[2] Unfortunately in the United States certification of causes of death is not, in the opinion of the Census Bureau, sufficiently accurate to justify any attempt to compile separately deaths from puerperal septicemia following abortion or self-induced abortion.

[3] In order to ascertain the risk of death in childbirth and from causes connected with confinement as distinguished from risk of death from diseases caused by pregnancy, it would be necessary to be able to separate deaths in the early months of pregnancy from those due to childbirth. Statistics are not available, however, accurately to measure the risk of death in childbirth as thus defined.

TABLE 10.—*Rates of maternal mortality, by result of confinement and term; Baltimore births in 1915*

Result of confinement, and term	Confinements	Deaths of mothers within 3 months after confinement	
		Number	Rate per 1,000 confinements
Miscarriage [1]	410	11	26.8
Premature	722	17	23.5
Stillbirths	100	4	25.0
Live births	562	13	23.1
Full term	10,331	40	3.9
Stillbirths	228	14	61.4
Live births	10,103	26	2.6

[1] Dead births of less than 7 months' gestation

STILLBIRTHS

In connection with the risk associated with premature births as compared with that associated with full-term births, the differences in risk associated with whether the infant was born alive or dead should be considered. Table 10 gives also the rates of maternal deaths in Baltimore for live births and stillbirths. In confinements which resulted in premature stillbirths the death rate of mothers was 25 as compared with a rate of 23.1 in confinements which resulted in premature births of living infants. But in confinements which resulted in stillbirths at term the death rate of mothers was 61.4, as compared with only 2.6 in those which resulted in births at term of living infants. In interpreting these results it should be remembered that the same condition might have been responsible both for the death of the mother and for the premature birth or stillbirth. The confinements which resulted in stillbirths at term probably include many in which some obstruction to labor, such as contracted pelvis, necessitated operative interference, a group of cases in which the risk both to the infant and to the mother is relatively high.

COMPLICATIONS OF PREGNANCY OR CONFINEMENT

The frequency with which certain conditions that may gravely affect the chances of life of the mother are found to occur is of great importance in a consideration of the factors affecting maternal mortality. In this section the available statistical data with regard to the frequency of occurrence of four of the most important of these conditions—contracted pelvis, abnormal presentation, placenta praevia, and eclampsia—will be considered.[4]

Contracted pelvis.

Contracted pelvis, the most frequent cause of which is rickets in infancy but which may be due to other bone diseases, developmental causes, or certain other causes (including perhaps heredity), is a complication of pregnancy that requires skilled obstetrical service if the best possible results are to be obtained. Depending on the

[4] For other aspects of the subject and for a discussion of other complications than those discussed here the reader is referred to medical treatises on obstetrics and to special articles and reports.

degree of contraction different procedures are recommended; in all cases, therefore, it is essential that the presence, and if present the degree, of contraction be determined by careful pelvic measurements before labor has begun in order that the best method of procedure may be adopted.

The proportion of confinements found by different series of measurements to be complicated with contracted pelvis [5] varied from about 4 to 35 per cent. Dr. Whitridge Williams gives figures based upon measurements of 3,837 consecutive patients who were delivered in the lying-in department of Johns Hopkins Hospital, which show that 8.5 per cent of the white and 32.6 per cent of the negro patients had contracted pelves.[6] He also cites the statistics of Flint, who in 1897 observed 8.46 per cent of contracted pelves in 10,233 patients delivered by the Society of the New York Lying-in Hospital. According to Doctor Williams, statistics for Germany based upon data from lying-in hospitals show frequencies varying from 7.9 per cent to 24.3 per cent in the different cities; in Austria the available figures vary from 3.8 to 10.4 per cent, indicating a rather lesser frequency than in Germany; in France "the yearly reports from Pinard's clinic indicate a frequency of about 5 per cent, while Budin and Tarnier give an incidence of 8 and 16 per cent, respectively." [7]

Since the frequency of contracted pelvis depends upon the frequency of occurrence of its causes, variations in the prevalence of these causes, especially rickets, may result in differences in the prevalence of pelvic contraction as a complication of pregnancy.

Abnormal presentations.

Breech presentations are found to occur in between 3 and 4 per cent and transverse presentations in slightly less than 1 per cent of all cases that come to or nearly to full term. Figures for Johns Hopkins Hospital based upon 7,500 cases show 94.6 per cent of cases of normal or vertex presentation, compared with 0.3 per cent of face, 3.9 per cent of breech, and 0.96 per cent of transverse presentation.[8]

Placenta praevia.

Placenta praevia, a condition which gravely affects the chances of life of mother and child, is a relatively rare complication; it occurs, according to the estimates of Dr. Whitridge Williams, in only about 1 out of every 1,000 cases in private practice and in about 4 out of every 1,000 cases in hospital practice.[9] It is very rarely found in first births, and the frequency of its occurrence increases with the number of previous births.[10] In cases of placenta praevia abnormal presentations are unusually frequent. According to statistics of such cases given by Müller, 9 per cent were breech and 24 per cent transverse

[5] "We designate a pelvis as contracted when it is so shortened in one or more of its diameters as to affect materially the mechanism of labor but without necessarily retarding the birth of the child. According to Litzmann, this is the case when the conjugata vera measures 9.5 centimeters or less in flat, and 10 centimeters or less in generally contracted pelves. * * * Litzmann's definition and criteria have been adopted throughout the world." Williams, J. Whitridge, M. D.: Obstetrics, pp. 737-738. New York, 1919.

[6] Ibid., p. 739. In a second series in which special attention was paid to the so-called "funnel" pelvis, larger proportions were obtained; in 7.5 per cent of the white and 34.5 per cent of the negro women pelvic contraction involving the inlet and in 5.9 per cent of the white and 6.4 per cent of the negro women pelvic contraction involving the outlet was found. This series was based on 2,215 full-term deliveries.

[7] Ibid., p. 739.

[8] Ibid., p. 225.

[9] Ibid., p. 884.

[10] Doranth: "Statistisches über Placenta Praevia." Chrobak's Berichte aus der 2ten geb. gyn. Klinik in Wien, 1897, i, 77-119.

presentations, as compared with 4 per cent and 1 per cent respectively for normal cases.[11]

Eclampsia.

Eclampsia, according to Dr. Whitridge Williams, occurs about twice in every 1,000 labors. In hospital practice it appears about 10 times in every 1,000 cases, its greater relative frequency being due to the tendency of patients who have had one attack of convulsions to seek hospital care.[12] It is relatively much more frequent among primiparae than among multiparae, and in cases of twins or triplets than in cases of single birth.

OBSTETRICAL OPERATIONS

In a small proportion of cases operative interference is necessary to save the lives of mother and child, and in other cases operative interference greatly improves the chances of life and health. The operative procedures most frequently resorted to are instrumental delivery, version, and extraction; of the operations proper, Cesarean section is the most frequent. Operations or operative procedures are resorted to most often on account of obstruction to labor due to disproportion between size of head of the infant and birth canal, to malformation of mother or child, or to tumor; malposition of the infant and placenta praevia are also important causes of operative interference with normal labor.

Frequency.

Statistics showing the frequency of the most important obstetrical operations and operative procedures are not available for the United States; in some instances figures have been compiled for certain hospitals or have been gathered in special studies in particular areas. The frequency with which Cesarean section is performed in Massachusetts is indicated by figures for the year 1922, which show that 1,161 Cesarean sections were performed for 90,904 births (including stillbirths), or 13 to every 1,000.[13] In 100 cases which terminated fatally the primary indications upon which this operation was performed were in 37 per cent of the cases obstruction due to malformation of mother or child, to disproportion between size of head and birth canal, or to tumor; in 25 per cent of the fatal cases the operation was resorted to because of toxemia.[14]

Figures showing the frequency of all kinds of obstetrical operations performed by physicians in Norway in 1917–18 are given in Table 11. Such operations were performed in 4 per cent of all deliveries; instrumental delivery was by far the most frequent, being performed in three-fourths of the cases. Besides these operations performed by physicians a considerable number—1,764, equal to 1.4 per cent of all confinements— were reported by midwives.[15]

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[11] Williams, J. Whitridge: Obstetrics, p. 887.

[12] Ibid., pp. 568–569.

[13] This figure may be too low since "replies were not received from a few of the smaller hospitals and it is probable that the total number of Cesarean sections was slightly larger." Hamblen, Angelina D.: "A statistical study of 100 Cesarean sections." The Commonhealth [Boston], vol. 10 (1923), p. 111.

[14] Ibid., p. 113.

[15] The source does not indicate the number of operations in the cases reported by midwives, if any, other than instrumental delivery, version, extraction, and afterbirth operations; it does not indicate whether these operations were performed by the midwife in attendance or by a physician who was called in because of the need for the operation. The numbers of extraction and "afterbirth" operations reported by midwives exceed the numbers reported as performed by physicians. Sundhetstilstanden og Medisinalforholdene, 1917 and 1918, Norges Offisielle Statistikk VII. 3, p. 57*–60*, VII. 58, pp. 37*–40*. Kristiania, 1921 and 1922.

TABLE 11.—*Frequency of obstetrical operations performed by physicians; Norway, 1917–18* [1]

Kind of operation	Obstetrical operations			Kind of operation	Obstetrical operations		
	Number	Per cent distribution	Per 1,000 confinements [2]		Number	Per cent distribution	Per 1,000 confinements [2]
Total	[3] 5,234	100.0	40.45	Cesarean section	20	0.4	0.15
				Craniotomy	44	.8	.34
Instrumental delivery	4,044	77.3	31.26	Embryotomy	15	.3	.12
Version	454	8.7	3.51	Induced abortion	39	.7	.30
Extraction	245	4.7	1.89	Afterbirth operation [4]	304	5.8	2.35
Induced premature delivery	68	1.3	.53				

[1] Compiled from Sundhetstilstanden og Medisinalforholdene, 1917 and 1918, Norges Offisielle Statistikk VII. 3, p. 60*, and VII. 58, p. 40.*
[2] Proportion based on 129,369 confinements in 1917–18.
[3] Total includes 1 case of pubiotomy.
[4] Efterbyrds operation.

The frequency of obstetrical operations and operative procedures depends primarily, of course, upon the prevalence of the specific conditions which call for operative interference and would be expected to change with any change in the prevalence of these conditions. This frequency depends also upon changes in the judgment of physicians and obstetricians as to whether an operation is advisable. With the advance of obstetrical knowledge on the one hand and with the decreased risk which operative interference now involves as compared with that prevailing a few decades ago (see Table 49, p. 72) on the other, the frequency with which operations are performed has probably increased. Figures for Norway for the period from 1900 to 1917, which are given in Table 12, show a marked increase in the frequency of operations performed by physicians. In spite of the increase in frequency of operative interference in Germany, according to Doctor Weinberg, the mortality following operations has decreased; in other words, the decrease in case mortality has more than offset the increase in the proportion of operations.[16]

TABLE 12.—*Frequency of obstetrical operations performed by physicians; Norway, 1900–1917* [a]

Year	Confinements—			Year	Confinements—		
	Total	Requiring operative interference			Total	Requiring operative interference	
		Number	Per 1,000			Number	Per 1,000
1900	67,070	1,724	25.7	1909	61,962	2,497	40.3
1901	66,994	1,825	27.2	1910	62,050	2,372	38.2
1902	65,974	2,156	32.7	1911	61,989	2,414	38.9
1903	65,917	1,790	27.2	1912	60,249	2,746	45.6
1904	64,671	1,990	30.8	1913	61,485	2,855	46.4
1905	63,277	2,049	32.4	1914	62,423	2,899	46.4
1906	61,877	2,015	32.6	1915	59,268	2,764	46.6
1907	61,270	2,105	34.4	1916	66,458	2,601	39.1
1908	61,454	2,467	40.1	1917	65,182	2,602	39.9

[a] Compiled from Sundhetstilstanden og Medisinalforholdene, 1900–1917; Norges Offisielle Statistikk.
[16] Weinberg, W.: "Kindbettfieber und Kindbettsterblichkeit." Handwörterbuch der Sozialen Hygiene (A. Grotjahn and J. Kaup), p. 589. Leipzig, 1912.

Recently there has been a marked reaction, at least in this country, against the tendency to resort to the use of instruments in normal cases merely to hasten delivery, since experience has shown that any operative interference is likely to increase the risk to both mother and child. Perhaps the decrease in the frequency of operations in 1916 and 1917 in Norway was due to a similar reaction against unnecessary operative interference.

Case mortality.

Comprehensive statistics showing the case mortality following the various obstetrical operations are difficult to obtain. Estimates based upon cases reported in medical literature are frequently quoted; they give undoubtedly a somewhat favorable picture, since, on the one hand, such results are usually presented by specialists who have a high degree of training and experience and, on the other, cases with favorable outcome are perhaps more likely to be deemed worthy of notice in the medical journals than cases with unfavorable outcome. Case-mortality figures based upon continuous series of unselected cases are not subject to such criticisms, though even such figures are likely to be from the practice of specialists in the types of obstetrical operations upon which they report. Statistics are available for but few entire States or countries.

The mortality in cases of Cesarean sections performed in Massachusetts during 1922 was 88 per 1,000.[17] Of the 100 deaths in such cases that formed the subject of a special study 30 per cent were caused by septicemia.[18] [19]

The mortality following or attending upon cases of obstetrical operations performed by physicians in Norway is shown in Table 13 for the period 1910–1918. The death rate in cases in which operative interference of any kind was resorted to was 12.9 as compared with an average mortality from puerperal causes of only 2.9 per 1,000 live births during this period. The mortality following instrumental delivery was low compared with that following other operative procedures.

The case mortality following obstetrical operations in Baden during the period 1900–1909 and in Bavaria during the period 1901–1906 is shown in Table 14.

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[17] Hamblen, Angelina D., "A statistical study of 100 Cesarean sections." The Commonhealth [Boston], vol. 10 (1923), p. 111.

[18] Ibid., p. 113. In Massachusetts in 1921, according to the report of the committee of the Massachusetts Medical Society on maternal and infant welfare, "one-sixth of all puerperal deaths were associated with Cesarean section, one-half of which were due to sepsis." Report of committee, Appendix 3 to Proceedings of the Council of the Massachusetts Medical Society, Feb. 7, 1923. Boston Medical and Surgical Journal, vol. 188 (March, 1923), p. 289.

[19] It is estimated that the mortality from Cesarean section if the operation is performed before labor has begun is about one-half of 1 per cent, if performed after labor has begun is 5 per cent, and if performed after labor has lasted for a considerable time rises as high as 10 per cent.

TABLE 13.—*Mortality of mothers following obstetrical operations performed by physicians; Norway, 1910–1918* [1]

Operation	Confinements with outcome reported [2]	Deaths of mothers		Operation	Confinements with outcome reported [2]	Deaths of mothers	
		Number	Per 1,000			Number	Per 1,000
Total	23,729	305	12.9	Cesarean section	110	21	190.9
				Craniotomy	317	24	75.7
Instrumental delivery	18,265	122	6.7	Embryotomy	60	9	150.0
Version	1,923	86	44.7	Induced abortion	145	2	13.8
Extraction	1,128	11	9.8	Afterbirth operation	1,485	19	12.8
Induced premature delivery	285	10	35.1	Other operations [3]	11	1	([4])

[1] Compiled from Sundhetstilstanden og Medisinalforholdene, 1900–1918, Norges Offisielle Statistikk.
[2] In cases in which different operations were performed upon each twin, or two or more triplets the confinement is classified according to the operation performed upon the last twin or triplet.
[3] Pubiotomy 3, laparotomy 2, supra-vaginal amputation 3, accouchement forcé 3.
[4] Not shown because base is less than 50.

TABLE 14.—*Case mortality following specified operations in Baden, 1900–1909, and in Bavaria, 1901–1906* [1]

Operation	Deaths per 1,000 cases		Operation	Deaths per 1,000 cases	
	Baden	Bavaria		Baden	Bavaria
	1900–1909	1901–1906		1900–1909	1901–1906
Placenta praevia	85	147	Induced premature birth	20	18
Instrumental delivery	6	13	Cesarean section	200	177
Version	20	21	Premature separation of placenta	13	34
Extraction	4				
Craniotomy	58	72			

[1] Weinberg, W.: "Kindbettfieber und Kindbettsterblichkeit." Handwörterbuch der Sozialen Hygiene (A. Grotjahn and J. Kaup), p. 589.

TIME FROM CHILDBIRTH TO DEATH OF MOTHER

No comprehensive data are available for the United States, showing the distribution of maternal deaths following childbirth according to the time interval between the birth and the mother's death. Such figures for Saxony in 1901–1904 are shown in Table 15. Over one-fourth of the deaths occurred during the first day and approximately one-half within the first week. In case of deaths from puerperal septicemia the interval was slightly longer than in case of deaths from other consequences of childbirth; from puerperal septicemia over one-third occurred after the end of the second week, and from other consequences of childbirth, three-fourths occurred within one week after confinement.

TABLE 15.—*Time interval from childbirth to death of mothers who died from causes connected with childbirth; Saxony, 1901–1904* [1]

Time from childbirth to death of mother	Deaths from puerperal causes			Deaths from non-puerperal causes which occur following confinement
	Total	Puerperal fever [2]	Other consequences of childbirth	
	Per cent distribution			
First day	27.2	1.8	54.4	9.5
First week	50.6	27.5	75.8	33.9
Second week	21.8	33.6	9.4	20.6
Third week	8.8	14.0	3.3	13.3
Fourth week	5.5	8.1	2.7	13.0
Fifth week	2.5	1.5	1.4	9.3
Sixth week	1.8	2.8	.6	5.7
Later than sixth week	1.5	2.5	.1	.4
Unknown	7.4	8.1	6.7	3.6

[1] Weinberg, W.: "Kindbettfieber and Kindbettsterblichkeit." Handwörterbuch der Sozialen Hygiene (A. Grotjahn and J. Kaup), p. 585.

[2] For puerperal fever, the sum of the percentages exclusive of the first line "first day" (which is included in the term "first week") does not equal 100 per cent. Presumably the figures 27.5 for "first week" should read 29.3. The error appears in the source quoted.

SINGLE OR PLURAL BIRTH

With reference to the maternal mortality rate in cases of plural and single births data are available for Norway which suggest that the mortality is higher in case of plural than in case of single births. According to figures given in Table 16, operative interference was nearly twice as frequent in plural as in single births, and according to Table 17 the mortality following obstetrical operations in cases of plural births was over twice as high as that in cases of single births.

TABLE 16.—*Frequency of obstetrical operations performed by physicians in single and plural births; Norway, 1910–1917* [1]

Single or plural birth	Confinements, 1910–1917—		
	Total	With recourse to operative interference	
		Number	Per 1,000
Total	499,104	21,264	42.6
Single	492,102	20,687	42.0
Plural	7,002	[2] 577	82.4

[1] Compiled from Sundhetstilstanden og Medisinalforholdene, 1910–1917, Norges Offisielle Statistikk, and from Norges Statistisk Årbok.

[2] Confinements with recourse to operative interference in case of either 1 twin or triplet or both twins, 2 triplets, or all 3 triplets.

TABLE 17.—*Case mortality following obstetrical operations performed by physicians; Norway, 1900–1917* [1]

Single or plural birth	Operations with outcome reported	Deaths of mothers	
		Number	Per 1,000
Total	41,742	691	16.6
Single	40,581	651	16.0
Plural	1,161	40	34.5
Twin births	1,141	39	34.2
Operation for both twins	649	26	40.1
Operation for one only	492	13	26.4
Triplet births	20	1	(2)

[1] Compiled from Sundhetstilstanden og Medisinalforholdene, 1900–1917, Norges Offisielle Statistikk.
[2] Not shown because base is less than 50.

AGE OF MOTHER

Figures showing the correlation between the mother's age and the maternal mortality rate are available for the United States birth-registration area and are shown in Table 18 for the year 1921. The mortality was lowest for the age group 20 to 24 and highest for the group under 15 years. For the oldest mothers—those 45 years of age and over—the rate was practically as high as for those under 15 years. This characteristic variation of maternal mortality with age is quite similar to the variations with age of mother of infant mortality from all causes and from causes peculiar to early infancy.[20] With regard to both puerperal and infant mortality the most favorable age period was found between 20 and 30 years. This variation undoubtedly reflects the mother's condition of health; the high mortality in the earliest age period is due perhaps to the physical immaturity of the mother, and the increasing mortality in the later periods is doubtless to be ascribed to the same lessening physical vitality which appears in the general tendency for morbidity and mortality rates to increase with age.

TABLE 18.—*Maternal mortality rates, by age of mother; United States birth-registration area, 1921* [a]

Age of mother	Deaths per 1,000 live births from—			Age of mother	Deaths per 1,000 live births from—		
	All puerperal causes	Puerperal septicemia	All other puerperal causes		All puerperal causes	Puerperal septicemia	All other puerperal causes
Total	6.8	2.7	4.1	25–29	5.6	2.4	3.2
				30–34	7.4	2.9	4.5
Under 15	20.0	5.4	14.6	35–39	10.3	3.6	6.7
15–19	6.8	2.7	4.0	40–44	13.1	4.3	8.8
20–24	5.0	2.2	2.8	45 and over	19.2	6.5	12.8

[a] Mortality Statistics, 1921, p. 80.

[20] Causal Factors in Infant Mortality, by Robert M. Woodbury, p. 40. U. S. Children's Bureau Publication No. 142.

The variation in the mortality from puerperal septicemia follows the same general trend as that from all causes but is slightly less marked. With regard to this cause particularly the question might be raised whether the variation is due in part to differences in the average quality of care received by the youngest or the oldest mothers, as both groups had a somewhat larger proportion of foreign-born and colored mothers than the intermediate groups. On the other hand, this variation may be due in large part to differences in case mortality. Unfortunately no statistics are available to show variations in case mortality by age of mother.

The mortality from puerperal causes other than septicemia was highest for the youngest mothers—those under 15 years of age. This is due in part to the fact that a large proportion of these mothers are primiparae, among whom, as will be shown in the next section, the mortality is especially high, and in part to the greater frequency of complications in confinement of mothers under 15 years of age. The high mortality from the causes other than septicemia among mothers over 40 years of age is due likewise in large part to the greater frequency of complications.

To throw light upon the influence that the disproportionate number of primiparae among the younger mothers has upon their mortality rate, figures are shown in Table 19 based upon births in New South Wales during the period 1893–1898. Although the average mortality rate for mothers between 15 and 20 years of age was 1.6 times that for mothers between 20 and 25, when the rates for these groups are compared first for primiparae and then for multiparae it appears that the mortality in the age group 15 to 19 was only 1.2 times and 1.1 times, respectively, that in the age group 20 to 24. In other words a considerable part but not all of the greater mortality found for the youngest mothers finds its explanation in the disproportionate number of primiparae. Except for the age group 15 to 19 the mortality rate increased markedly with the age of the mother among both the primiparae and the multiparae.

TABLE 19.—*Maternal mortality rates, by age of mother and order of birth; New South Wales, 1893–1898* [1]

Age of mother	Deaths from puerperal causes per 1,000 live births			Age of mother	Deaths from puerperal causes per 1,000 live births		
	Total	Primiparae	Multiparae		Total	Primiparae	Multiparae
15–19	7.74	8.19	3.34	35–39	8.99	13.02	8.85
20–24	4.79	7.09	3.04	40–44	11.56	20.41	11.40
25–29	5.29	9.31	4.41	45 and over	12.54		12.66
30–34	7.41	15.28	6.80				

[1] Compiled from Childbirth in New South Wales; a study in statistics, by T. A. Coghlan, pp. 48–50, 53 (Sydney, 1900).

ORDER OF BIRTH

Data showing the relative maternal mortality rates by order of birth are available for Baltimore, where infant mortality was studied by the Children's Bureau. Though these figures, as has been suggested, probably do not include all cases of deaths of mothers during the early months of pregnancy for which no births were recorded and though they do include all deaths whether from puerperal or from

other causes if they occurred within three months after confinement, yet they doubtless indicate the trend of the rates by order of birth. According to Table 20 the mortality was found to be higher for first births than for second, third, or fourth births; for third births it was lowest of all, and it gradually increased from the third until it reached a maximum with orders "eighth and later." This trend of maternal mortality, like that shown in considering the age of the mother, is similar to that of infant mortality.

TABLE 20.—*Maternal mortality rates, by order of birth; Baltimore, 1915*

Order of birth	Confinements	Deaths of mothers within three months after confinement		Order of birth	Confinements	Deaths of mothers within three months after confinement	
		Number	Per 1,000 confinements			Number	Per 1,000 confinements
Total	11,463	62	5.4	Third	1,580	3	1.9
				Fourth	1,197	5	4.2
First	3,050	19	6.2	Fifth to seventh	2,002	15	7.5
Second	2,532	11	4.3	Eighth and later	1,102	9	8.2

The most comprehensive study of the influence of order of birth upon the maternal mortality rate is that made by T. A. Coghlan of data for New South Wales.[21] He shows that for married mothers the "risk attending the first birth is greater than at any subsequent one up to but not including the ninth." The smallest risk was found in the second confinement, though that in the third was not much greater. After the third confinement the risk increased rapidly.[22] The rates of mortality are shown in Table 21.

TABLE 21.—*Maternal mortality rates, by order of birth; births to married women, New South Wales, 1893–1898* [a]

Order of birth	Births	Deaths in childbirth	Maternal mortality rate	
			Actual experience	Adjusted figures
First	41,385	365	8.82	8.80
Second	34,089	150	4.40	4.70
Third	29,334	150	5.11	5.09
Fourth	24,675	130	5.27	5.54
Fifth	20,621	136	6.60	6.10
Sixth	16,788	104	6.19	6.82
Seventh	13,479	99	7.34	7.54
Eighth	10,328	90	8.71	8.72
Ninth	7,510	79	10.52	9.92
Tenth	5,213	47	9.02	10.40
Eleventh	3,420	31	9.06	11.00
Twelfth	1,983	28	14.12	12.46
Thirteenth	1,071	15	14.01	14.50
Fourteenth and over	1,039	8	7.70	[b]

[a] Coghlan, T. A.: Childbirth in New South Wales, pp. 47–48, 65. The original probabilities are multiplied by 1,000 for this presentation. Total number of cases, 210,935 births and 1,432 deaths of mothers.
[b] Figures not computed in original, since they are based upon relatively few cases.

[21] Coghlan, T. A.: Childbirth in New South Wales; a study in statistics. Sydney, 1900.
[22] Ibid., p. 48.

EARNINGS OF FATHER

The figures in Table 22 show for three broad groups classified by father's earnings the maternal death rates in seven cities in which special studies of infant mortality were made by the Children's Bureau. These figures suggest that the rate varies inversely with the amount of father's earnings; it was only 3.3 (per 1,000 confinements) in families in which the fathers earned $850 or over, compared with 5.3 in families in which the fathers earned less than $850. This relationship is doubtless to be explained by differences in the quality of care available to the mothers in the various income groups. An analysis of the amount and type of prenatal and confinement care available to mothers in Baltimore showed clearly that the low-income classes were materially handicapped in the matter of medical prenatal care, nursing services, duration of hospital care after confinement, and in other ways,[23] though because of the free clinic service that is unusually plentiful in that city they were not so much handicapped as would otherwise have been the case.

TABLE 22.—*Death rates of mothers dying within three months after confinement, by earnings of father; confinements in seven cities* [1]

Earnings of father	Confinements	Deaths of mothers within three months after confinement	
		Number	Per 1,000
Total	22,435	111	4.9
Less than $850	14,810	78	5.3
$850 and more	7,233	24	3.3
Not reported	392	9	(2)

[1] In which infant-mortality studies were made by the Children's Bureau.
[2] Not shown or not reported because not significant.

COLOR AND NATIONALITY OF MOTHER

Color and race.

The death rate from all puerperal causes is higher for the negro than for the white race. In the birth-registration area in 1921 the maternal mortality rate per 1,000 live births was 67 per cent greater for the colored than for the white mothers. A relatively greater mortality among the colored was found both in the cities and in the rural districts; but since a larger proportion of the colored than of the white lived in rural areas, in which the average rate of mortality was lower than in the cities, the mortality among the colored appears even greater relatively to that among the white when the urban and rural districts are considered separately. In the cities the colored rate (13.1) was 77 per cent greater than the white (7.4); and in the rural districts the colored rate (9.7) was 80 per cent greater than the white (5.4).

The analysis by cause of death in Table 23 shows that the rates for the colored were higher not only from puerperal septicemia but

[23] See Infant Mortality: Results of a field study in Baltimore, Md., based on births in one year, Appendix VI (U. S. Children's Bureau Publication No. 119, Washington, 1923).

also from the group of all other puerperal causes. The excess mortality from puerperal septicemia among the colored was most marked in the cities, where the rate was three-fourths higher than that for the white (5.7 as compared with 3.2); in the rural areas the rate for the colored was one-half higher than that for the white (3.1 as compared with 2). In both urban and rural districts the mortality from "other puerperal" causes among the colored was approximately one and four-fifths times that prevailing among the white.

TABLE 23.—*Maternal mortality rates, by cause of death and by color, in urban and rural districts; United States birth-registration area, 1921* [1]

Urban or rural districts, and color	Deaths from puerperal causes per 1,000 live births		
	All causes	Puerperal septicemia	Other puerperal causes
White	6.44	2.59	3.85
Urban	7.40	3.16	4.25
Rural	5.42	1.99	3.43
Colored	10.77	3.89	6.88
Urban	13.10	5.66	7.44
Rural	9.74	3.11	6.63

[1] Compiled from Mortality Statistics, 1921, pp. 312–317, and Birth Statistics, 1921, p. 43 (U. S. Bureau of the Census).

The rates for white and colored are shown separately in Table 24 for each State in the birth-registration area in which at least two in every hundred of the population were colored. In all but two States, California and Washington, the rate for the colored was higher than that for the white; in these two States the colored were largely Japanese. It is noteworthy that the excess mortality among negroes appeared both in States with large proportions and in those with small proportions of negroes in the population. From puerperal septicemia the rate for colored in many of the Northern and Western States was even higher in relation to that for whites than in the Southern States. Thus, in New Jersey the colored rate from puerperal septicemia was over three times and in New York nearly three times the white rate.

The high mortality among negro mothers was found in spite of an unusually favorable age composition. In 1921, of the negro births, 72 per cent, compared with only 64.2 per cent of the white births, were to mothers between 15 and 30 years of age, the age groups for which the maternal mortality rate was below average.[24]

[24] Compiled from Birth Statistics, 1921, p. 179. Percentages based upon cases for which age of mother was reported.

TABLE 24.—*Mortality rates from puerperal septicemia and from all puerperal causes, by color, in States in the birth-registration area with at least 2 per cent of the population colored, 1921* [1]

State	Death rates per 1,000 live births—all puerperal causes		Death rates per 1,000 live births—puerperal septicemia	
	White	Colored	White	Colored
California	7.1	4.5	3.1	2.0
Delaware	6.1	7.7	2.9	3.1
District of Columbia	9.9	10.8	3.1	3.8
Indiana	6.6	15.9	3.3	6.5
Kansas	6.4	7.6	2.8	4.7
Kentucky	5.7	14.8	2.6	7.0
Maryland	6.0	9.6	2.0	3.7
Mississippi	7.1	12.0	2.2	4.0
New Jersey	5.6	12.5	2.2	7.0
New York	6.1	13.9	2.4	6.8
North Carolina	6.1	10.2	1.4	3.0
Ohio	7.1	11.6	3.3	5.4
Pennsylvania	6.7	9.8	2.9	4.0
South Carolina	7.8	11.8	1.7	3.4
Virginia	5.7	9.9	1.8	3.5
Washington	7.9	5.6	3.6	3.1

[1] Compiled from Mortality Statistics, 1921, pp. 312-341.

An important cause of the heavier puerperal mortality among the colored [25] is probably the poorer medical and midwifery service which they receive. Their excessive death rate from puerperal septicemia was undoubtedly due to poor quality of confinement care, and a considerable part of their high mortality from other diseases connected with pregnancy and confinement was probably due to lack of skilled attention during pregnancy as well as at confinement. Among the conditions which cause high mortality among the colored from "other puerperal" causes must be mentioned the relative prevalence of venereal disease, as indicated, for example, by studies made by Dr. Whitridge Williams.[26] Conclusive evidence is not available as to whether the negro race is less resistant than the white to puerperal septicemia or more subject to "contracted pelvis" (see p. 27) or difficult labor—causes which are likely to lead to increased puerperal mortality.[27]

Nationality.

Marked differences were found in the maternal mortality rates for the several nationality groups within the birth-registration area. Table 25 shows that in 1921 the mortality was slightly lower among foreign-born white mothers than among native white mothers. Among the nationalities included in the foreign-born white group it was lowest (5) for mothers born in Russia, who were doubtless largely of Russian-Jewish nationality, and next to lowest (5.1) for mothers born in Italy. At the other extreme were the rates for mothers born

[25] Variation in the completeness of birth registration among white and colored groups may account for a small part of the difference in the rates; the colored rate is probably overstated relatively to the white because of less complete registration of births. See Birth Statistics, 1921, pp. 11–13.

[26] Williams, J. Whitridge: "The limitations and possibilities of prenatal care." Transactions of Fifth Annual Meeting of the American Association for Study and Prevention of Infant Mortality, Boston, Mass., No. 12-14, 1914, pp. 32-48. Baltimore, 1915.

[27] "Evidence for Baltimore indicates that contracted pelvis (following rickets in infancy) is much more common among negroes than among whites. Evidence indicates that in the cities rickets is especially common among negroes, and among negroes in the country districts rickets is infrequent. It is difficult, therefore, to draw any conclusion as to whether throughout the United States contracted pelvis is more or is less prevalent among the negroes than among the whites." Williams, J. Whitridge: Obstetrics, p. 739.

in Ireland (9.1), Great Britain (8.1), Canada (7.9), Hungary (7.4), and Germany (7.1). The racial stocks represented in the nationalities of the foreign-born groups for which the rate was highest are those which principally compose the native white population; it is noteworthy, however, that the puerperal death rate for the native white population was considerably below the rates for any of these foreign-born groups. The mortality in the Scandinavian group was practically the same as that in the native white population. Mothers born in Austria and Poland had rates considerably below that for the native white population, though not quite so favorable as those for mothers born in either Italy or Russia.

Similar variations were found in the mortality rates from puerperal septicemia and from "other puerperal causes." The lowest rates from puerperal septicemia were those for mothers born in Italy, Russia, and the Scandinavian countries; the highest, for mothers born in Hungary, Great Britain, Ireland, and Germany. The lowest rates from "other puerperal causes" were found for mothers born in Poland, Russia, Italy, and Austria; the highest, for mothers born in Ireland, Canada, Great Britain, and the Scandinavian countries.

TABLE 25.—*Maternal mortality rates, by cause of death and nationality of mother; United States birth-registration area, 1921* [1]

Country of birth, and race	Deaths from puerperal causes per 1,000 live births		
	All puerperal causes	Puerperal septicemia	Other puerperal causes
Birth-registration area	6.8	2.7	4.1
White	6.4	2.6	3.8
United States	6.6	2.6	3.9
Foreign	6.0	2.5	3.5
Austria [2]	5.9	2.7	3.3
Hungary	7.4	3.8	3.6
Canada	7.9	2.7	5.2
Denmark, Norway, and Sweden	6.4	2.3	4.2
England, Scotland, and Wales	8.1	3.5	4.6
Ireland	9.1	3.3	5.8
Germany [3]	7.1	2.9	4.2
Italy	5.1	2.0	3.1
Poland (n. o. s.)	5.7	2.7	3.0
Russia [4]	5.0	2.0	3.0
Other	5.6	2.7	2.9
Colored	10.8	3.9	6.9

[1] Mortality Statistics, 1921, pp. 80–81. All these rates are subject to a slight error, as a small number of deaths for which country of birth and births for which country of birth of mother were not reported could not be classified according to country of birth.
[2] Includes Austrian Poland.
[3] Includes German Poland.
[4] Includes Russian Poland.

Differences in death certification and in registration of births, in prenatal and confinement care, and in health conditions or physical vigor peculiar to the nationality may be considered as causes of these variations.

Since the maternal mortality rate is higher for births to older than for those to younger mothers, except for the relatively small group under 15 years of age, variations in the average age of mothers in the

nationality groups would alone cause differences in the rates for these nationalities. When the varying ages of the mothers are taken into account, as in Table 26, the mortality among foreign-born mothers appears relatively more favorable than that among native white mothers. The mortality among mothers born in Great Britain and Canada was found to be only slightly above, that among mothers born in Hungary identical with, and that among mothers born in Germany slightly lower than, that among mothers born in the United States. Furthermore, the allowance for differences in age of mother tends to make the rates for mothers born in Italy, Russia, Poland, and the Scandinavian countries even more favorable, as compared with that for native white mothers, than appeared from the crude figures.[28]

TABLE 26.—*Maternal mortality rates, by country of birth and race, adjusted to eliminate influence of differences in age composition; United States birth-registration area, 1921* [1]

Country of birth, and race	Deaths from puerperal causes per 1,000 live births		
	All puerperal causes	Puerperal septicemia	Other puerperal causes
Birth-registration area	6.8	2.7	4.1
White	6.4	2.6	3.8
United States	6.7	2.6	4.0
Foreign born	5.5	2.4	3.1
Austria [2]	5.4	2.5	2.8
Hungary	6.7	3.4	3.3
Canada	7.5	2.8	4.8
Denmark, Norway, and Sweden	5.6	2.1	3.5
England, Scotland, and Wales	6.9	3.2	3.7
Ireland	8.8	3.5	5.3
Germany [3]	5.7	2.3	3.5
Italy	4.7	1.9	2.8
Poland (n. o. s.)	5.1	2.4	2.7
Russia [4]	4.8	2.0	2.8
Other	5.4	2.6	2.8
Colored	10.8	3.9	6.9

[1] Mortality Statistics, 1921, pp. 80–81.
[2] Includes Austrian Poland.
[3] Includes German Poland.
[4] Includes Russian Poland.

Little evidence is available regarding the extent of prenatal care or the quality of confinement care received by mothers of the various nationality groups.[29]

In a study of prenatal care in the city of Baltimore in 1915 it was found that the mothers of the Jewish race had consulted a physi-

[28] Mortality Statistics, 1921, pp. 80–81.

[29] No separate discussion is given of attendant at birth as a factor in maternal mortality for the reason that statistical comparisons of rates among births attended by physicians compared with those among births attended by midwives are complicated by (1) a selection of risks favorable to the midwife and unfavorable to the physician; (2) difficulties in assignment of cases attended by both physicians and midwives; and (3) the influence of nationality customs and preferences upon the choice of attendant. These factors are impossible to separate satisfactorily in existing statistical material, and without their separation no final conclusion can be drawn from the statistics alone regarding the relative mortality in the two groups. For an interesting study of this problem see "Maternal mortality in the first month of life in relation to attendant at birth," by Julius Levy, M. D., in American Journal of Public Health, Vol. XIII (February, 1923), pp. 88–95. See also "The relation of the midwife to obstetric mortality, with especial reference to New Jersey," by M. Pierce Rucker, M. D., in American Journal of Public Health, Vol. XIII (October, 1923), pp. 816–821, and Doctor Levy's discussion, pp. 821–822.

cian at least once during pregnancy in nearly as large a proportion of cases as those of the native white or of colored groups. Very few Polish mothers, on the other hand, saw a physician during pregnancy. The extent of prenatal care is shown in Table 27. These figures may depend to a considerable extent upon the special facilities for prenatal care given by the clinics of Baltimore and therefore may not be typical of other cities.

TABLE 27.—*Extent of prenatal care among mothers, by source of care and by color and nationality of mother; Baltimore, 1915*

Color and nationality of mother	Total mothers [1]	Per cent having no prenatal care	Per cent having prenatal care—					Per cent not reported
			Total	From clinic physician [2]			From private physician only	
				Total	The three clinics [3]	Other clinics		
Total	11,463	47.5	52.4	12.6	7.8	4.8	39.8	0.1
Native white	7,117	41.5	58.3	5.6	3.8	1.8	52.8	.1
Jewish	996	46.5	53.4	31.7	22.6	9.1	21.7	.1
Polish	646	86.1	13.9	8.2	5.7	2.5	5.7	
Italian	435	77.9	22.1	8.5	6.4	2.1	13.6	
Other foreign-born white	780	63.1	36.5	8.8	6.4	2.4	27.7	.4
Colored	1,489	42.8	57.0	38.1	18.9	19.2	18.9	.2

[1] Includes only married mothers to whom children were born in 1915.
[2] With or without care from other physician.
[3] Johns Hopkins, Babies' Milk Fund Association, and Mothers' Relief Society.

So far as confinement care is concerned, the evidence available is limited to kind of attendant at birth and to whether the birth occurred in a hospital. Such information is available for births in Newark, N. J., in 1921, and for births during the period from 1911 to 1915 in eight cities in which studies of infant mortality were made by the Children's Bureau. Tables 28 and 29 summarize this material. The figures show that Italian mothers, especially, prefer the midwife to the physician and that English and Irish mothers are attended by physicians in an even larger proportion of cases than are native white mothers. Though these figures throw some light upon the preference of certain nationalities with regard to confinement care, without evidence relating to the quality of such care they are insufficient for definite conclusions.

TABLE 28.—*Attendant at birth, by nationality of mother, Newark, N. J., 1921* [1]

Nativity of mother	Per cent distribution	Per cent of births attended by—			
		Total	Physician	Hospital	Midwife
Total	100.0	100	30.1	31.7	38.0
Native [2]	51.5	100	37.3	45.7	16.9
Colored	(3)	100	37.0	41.4	18.0
Foreign born:					
Italian	20.9	100	12.1	4.2	83.5
Russian	7.1	100	39.3	35.5	25.2
Austrian	4.8	100	25.2	21.1	53.5
German	1.3	100	35.9	42.4	21.5
English	1.0	100	32.8	56.8	10.4
Irish	2.2	100	51.9	34.2	13.8
Other	10.9	100	20.5	15.8	63.6

[1] Levy, Julius, M. D.: "Maternal mortality in the first month of life in relation to attendant at birth." American Journal of Public Health, Vol. XIII (February, 1923), p. 88.
[2] Includes colored.
[3] Equals 5.4 per cent of total and 10 per cent of native.

TABLE 29.—*Attendant at birth, by color and nationality of mother; births in eight cities*

Color and nationality of mother	Total births	Births attended by—						
		Physician		Midwife		Other or none		Not reported
		Number	Per cent	Number	Per cent	Number	Per cent	
Total	22,281	16,200	72.7	5,780	25.9	293	1.3	8
White	20,704	15,058	72.7	5,351	25.8	287	1.4	8
Native	11,664	9,534	81.7	2,082	17.8	46	.4	2
Foreign born	9,040	5,524	61.1	3,269	36.2	241	2.7	6
Italian	1,407	601	42.7	760	54.0	46	3.3	
Jewish	1,257	892	71.0	363	28.9	2	.2	
French Canadian	1,119	1,103	98.6	12	1.1	4	.4	
German	750	414	55.2	326	43.5	10	1.3	
Polish	1,202	464	38.6	728	60.6	7	.6	3
Portuguese	687	212	30.9	389	56.6	85	12.4	1
Other	2,615	1,836	70.2	691	26.4	86	3.3	2
Not reported	3	2				1		
Colored	1,577	1,142	72.4	429	27.2	6	.4	

Though differences may exist in the qualifications of the physicians who attend at deaths of mothers of different nationalities, or in the manner or the faithfulness with which they certify to the cause of death, no specific evidence on these points is available. It is doubtful whether the differences in the rates can be due to variations in methods of certification, since all are subject to the same system of checking up of unsatisfactory returns of cause of death. So far as birth registration is concerned it is probably better among the native white than among the foreign-born population and better among the English-speaking than among the non-English-speaking foreign-born groups. But as the maternal mortality rates for the former groups are high better birth registration would tend to increase the differences in favor of the non-English-speaking foreign-born nationalities.

With reference to the influence or even the existence of racial factors apart from those which may influence the quality and types of prenatal and confinement care no clear evidence is available. It is perhaps suggestive that in maternal mortality rates the relative rank of the various countries is similar to that of the corresponding nationality groups among the foreign-born mothers in this country. For example, the puerperal death rate in Italy is one of the lowest, and the rates in England and Wales, Scotland, Ireland, New Zealand, and Australia are relatively high. (See p. 57.) Though the rates in these country-of-birth groups in the United States are all considerably above those in the corresponding foreign countries, the relative rank may perhaps indicate the presence of racial factors; on the other hand it may indicate merely the influence of some custom or preference that is associated with the race or nationality group.

URBAN AND RURAL DISTRICTS

The maternal mortality rate in 1921 for cities in the birth-registration area, according to Table 30, was considerably higher than that for rural districts (7.7 as compared with 5.9). From puerperal

septicemia the rate for the cities (3.3) was 1½ times that for the rural districts (2.1). From other puerperal causes the urban rate was only very slightly higher than the rural (4.4 as compared with 3.8). In each of the years 1915 to 1920, according to Table 31, the maternal mortality rates in urban and rural districts had the same relative positions as in 1921.

TABLE 30.—*Maternal mortality rates, by size of city; United States birth-registration area, 1921*

Cities and rural districts [1]	Deaths from puerperal causes per 1,000 live births		
	All puerperal causes	Puerperal septicemia	All other puerperal causes
Rural districts	5.9	2.1	3.8
Cities	7.7	3.3	4.4
10,000–25,000	8.3	3.4	4.9
25,000–50,000	8.1	3.6	4.5
50,000–100,000	7.9	3.3	4.7
100,000 and over	7.5	3.2	4.2

[1] Cities include only those of 10,000 population and over; the rural districts include the remainder of the country.

TABLE 31.—*Maternal mortality rates in urban and rural districts; United States birth-registration area as of 1915 (exclusive of Rhode Island), 1915–1921* [1]

Year	Deaths from puerperal causes per 1,000 live births					
	All puerperal causes		Puerperal septicemia		Other puerperal causes	
	Cities [2]	Rural districts	Cities [2]	Rural districts	Cities [2]	Rural districts
1915	6.39	5.55	2.68	1.96	3.72	3.59
1916	6.48	5.78	2.88	1.97	3.60	3.82
1917	6.53	5.81	2.83	2.18	3.69	3.63
1918	9.06	8.58	2.52	1.92	6.54	6.66
1919	7.26	6.06	2.64	1.77	4.62	4.29
1920	7.95	7.00	2.81	2.10	5.14	4.91
1921	7.18	5.36	2.98	1.99	4.21	3.37

[1] Compiled from Birth Statistics, 1915–1921, and Mortality Statistics, 1915–1921.
[2] In cities are counted only those which at the date of the preceding census had at least 10,000 population.

One possible source of error in comparing death rates from puerperal causes, other than septicemia, in urban and rural districts lies in the tendency of mothers in rural areas to seek the better hospital facilities of the cities, especially when complications are expected. Confinements of nonresident mothers in urban areas probably include, therefore, a disproportionate number of difficult cases, in which the risk of death is considerably higher than normal. For example, in Baltimore in 1921, deaths of nonresidents from puerperal causes formed 11 per cent of the total of such deaths, whereas in 1915 during the course of an intensive study of infant mortality in that city it was found that only 2.8 per cent of the legitimate births occurred to

nonresident mothers.[30] In Milwaukee in 1921 the deaths of nonresidents from puerperal causes formed at least 11.1 per cent of the total of such deaths, and in the same year 5.6 per cent of the births occurred to nonresident mothers.[31] The rates, therefore, calculated per 1,000 births, are biased in favor of the rural districts because of this transfer of cases involving a high degree of risk.[32]

If allowance were made for the transfer of difficult cases to city hospitals the mortality rates from puerperal causes other than septicemia might be found to be higher for rural than for urban areas. This conclusion is further strengthened by consideration of the probability that the deaths are more correctly certified in the cities than in the rural districts.

On the other hand, the mortality rates from puerperal septicemia (per 1,000 births or per 100,000 population) are for the most part characteristic of the locality.[33] For puerperal septicemia is due to an infection which is contracted usually at the place of confinement and is chargeable in most cases, though not in all, to the physicians or other persons in attendance. Consequently, most of the deaths from puerperal septicemia among nonresident as well as among resident mothers are properly chargeable to the locality where the confinement occurred. In the mortality from this disease the rural areas appear to have a decidedly better record than do the urban; but this apparently more favorable record may be in part merely a reflection of less accurate reporting in the rural areas.

The classification of cities into groups according to size brings out the interesting fact that the highest mortality from puerperal septicemia was found not in the largest centers but in the group of cities which had populations of 25,000 to 50,000. The rate increased from 2.1 in the rural areas to 3.4 in the cities of 10,000 to 25,000, and to a maximum of 3.6 in the cities of 25,000 to 50,000. In the cities of 50,000 to 100,000 population the rate was 3.3, and in the group of cities of 100,000 population or over it was 3.2. Except for the rural areas the largest cities had the lowest rate. (See Table 30.)

From "other puerperal causes" the lowest rate (3.8) was also for the rural districts, followed by the rate of 4.2 for the largest cities; the highest rate (4.9) was for the places of 10,000 to 25,000 population. The low relative mortality in the rural districts may be due in part to a transfer of the complicated cases to the city hospitals and in part to a poorer certification of causes of death. The low relative mortality in the largest cities suggests that the superior hospital facilities and medical attendance at childbirth and during pregnancy, which are usually available in such cities, are important factors in reducing the mortality rates.

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[30] Mortality Statistics, 1921, p. 84; Infant Mortality; results of a field study in Baltimore, Md., p. 20.

[31] The deaths from puerperal causes in Milwaukee in 1921 numbered 81, a figure which was reduced by the net excess of deaths in Milwaukee of nonresidents over deaths elsewhere of residents of Milwaukee to 72. Mortality Statistics, 1921, p. 84. Information as to the percentage of births to nonresidents and transients was furnished by courtesy of Dr. I. F. Thompson, Deputy Health Commissioner, Milwaukee, Wis.

[32] Rates per 100,000 population are, of course, subject to an even greater error; in this case to obtain rates valid for comparative purposes all the deaths of nonresidents should be allocated to the place of residence.

[33] But there is no doubt that the risk of infection is greatly increased in complicated cases requiring operative interference over that in cases of normal delivery. Some infected cases also may be transferred from rural districts to city hospitals.

TREND OF PUERPERAL MORTALITY IN THE UNITED STATES[1]

Figures showing over a 22-year period changes in the rate of mortality from all puerperal causes per 100,000 population in the expanding death-registration area are given in Table 32. If these figures are accepted at their face value the rate increased from 13.3 in 1900 to 16.9 in 1921. From puerperal septicemia it increased from 5.7 in 1900 to a maximum of 7.4 in 1911, from which point it decreased to 6.8 in 1921. From other puerperal causes it increased from 7.6 in 1900 to 10.1 in 1921. In this comparison rates expressed in terms of population are used since satisfactory birth statistics are not available throughout the period for the whole of this area. Since the birth rate is falling, a constant puerperal mortality measured in terms of births would show a slight decrease if measured in terms of population; and hence these rates expressed in terms of population understate the increase in the risk rates from puerperal mortality during this period. Because of this fact the slight apparent decline in puerperal septicemia since 1911 which is indicated by the figures can not be accepted as conclusive evidence of the real trend of mortality until the influence of the decrease in birth rate has been eliminated. (See p. 51.)

TABLE 32.—*Trend of mortality rates from puerperal causes; expanding death-registration area, 1900–1921*

Year	Deaths from puerperal causes, per 100,000 population			Year	Deaths from puerperal causes, per 100,000 population		
	Total	Puerperal septicemia	Other puerperal causes		Total	Puerperal septicemia	Other puerperal causes
1900	13.3	5.7	7.6	1911	16.0	7.4	8.6
1901	13.7	6.0	7.7	1912	15.0	6.5	8.5
1902	13.0	5.7	7.3	1913	15.8	7.2	8.7
1903	14.0	6.1	7.9	1914	16.0	7.1	8.9
1904	15.3	6.9	8.5	1915	15.3	6.3	9.0
1905	14.9	6.8	8.1	1916	16.3	6.7	9.6
1906	15.1	6.2	8.9	1917	16.7	6.9	9.8
1907	15.6	6.8	8.9	1918	22.3	6.5	15.9
1908	15.7	7.0	8.7	1919	17.0	5.8	11.2
1909	15.3	6.7	8.6	1920	19.2	6.6	12.5
1910	15.7	7.2	8.5	1921	16.9	6.8	10.1

With the possible exception of mortality from puerperal septicemia the figures in Table 32 indicate a marked increase in maternal death rates during the 22-year period covered. In order to determine whether this increase indicated by the statistics is due to an increase in the mortality from puerperal causes or is simply the result of changes in the area to which the statistics relate, of improvements in certification of causes of death, or of the method of calculating the

[1] A summary of this section was published in the American Journal of Public Health for September, 1924 (Vol. XIV, pp. 738–743).

rate, a detailed examination of the influence of these statistical factors must be made. Three factors should be considered: (1) The expansion of the area; (2) the decrease in the birth rate; and (3) improvements in certification of causes of death.

With regard to the first factor, since these figures relate to the expanding death-registration area, the first questions which must be answered are, How much, if any, of the apparent increase is due merely to the addition to this area of States with higher puerperal mortality rates than those in the original area, and how much is due to an increase in mortality rates in the original or in the added areas? In 1900 the death-registration area included 40.5 per cent of the population of the United States; in 1920 it included more than twice as large a proportion (82.2 per cent). The mortality rates in the original registration States (including the District of Columbia but excluding registration cities in nonregistration States) and in States added during each year are shown in Table 33. The result of additions of new States to the area was to increase slightly the mortality rates from all puerperal causes in 1906, 1911, 1913, 1916, 1917, and 1919, and to decrease them slightly in 1908, 1909, 1910, 1914, 1918, and 1920, relatively to what they would have been if no additions had been made.

The influence of changes in territory may be eliminated in either of two ways. The simpler method is to study the trend of mortality in the original registration States of 1900. In this area the rate from all causes rose from 13.4 in 1900 to 15.1 in 1921. From puerperal septicemia it rose from 5.8 in 1900 to a maximum of 7.1 in 1911 and fell to 6.1 in 1921. From all other puerperal causes, however, it showed a continuous increase from 7.6 in 1900 to 11.5 in 1920, with a decrease to 9 in 1921. These increases in each case are slightly less than the increases shown in the expanding area.

TABLE 33.—*Maternal mortality rates in the original death-registration area and in each addition to the area; 1900–1921* [1]

Area	DEATH RATES PER 100,000 POPULATION																					
	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921
	ALL PUERPERAL CAUSES																					
Death-registration States (includes District of Columbia)	13.4	13.2	12.6	13.1	14.9	14.6	15.0	15.5	15.5	15.0	15.4	15.5	14.4	15.5	15.4	14.8	16.0	16.5	22.1	16.8	19.0	16.7
States in area in 1900 [2]	13.4	13.2	12.6	13.1	14.9	14.6	14.4	15.1	14.3	14.4	15.1	15.5	14.1	14.9	15.4	14.8	14.8	15.5	20.5	15.3	17.5	15.1
States added in 1906 exclusive of South Dakota [3]	------	------	------	------	------	------	16.4	16.5	18.3	17.4	17.0	15.7	15.2	16.9	16.0	15.6	16.2	16.0	24.6	16.1	18.5	16.6
South Dakota	------	------	------	------	------	------	13.8	12.6	12.5	13.0	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
States added in 1908 (Washington, Wisconsin)	------	------	------	------	------	------	------	------	14.7	12.8	13.2	13.6	12.0	12.5	12.0	12.6	13.5	13.3	15.8	12.1	16.0	14.0
State added in 1909 (Ohio)	------	------	------	------	------	------	------	------	------	14.1	15.2	14.7	14.4	13.6	15.4	13.3	15.2	15.7	21.5	14.6	16.9	15.8
States added in 1910 (Minnesota, Montana, Utah)	------	------	------	------	------	------	------	------	------	------	13.3	15.1	13.8	15.3	14.1	14.5	15.0	16.3	22.6	17.9	19.2	15.1
States added in 1911 (Kentucky, Missouri)	------	------	------	------	------	------	------	------	------	------	------	17.3	16.0	16.9	15.8	14.3	14.8	16.0	19.8	15.2	15.2	15.7
State added in 1913 (Virginia)	------	------	------	------	------	------	------	------	------	------	------	------	------	19.0	22.5	21.4	21.0	22.1	29.7	21.9	24.5	20.9
State added in 1914 (Kansas)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	12.3	13.1	16.9	16.8	25.4	17.0	18.8	15.0
States added in 1916 (North Carolina, South Carolina)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	26.9	26.0	33.3	28.0	32.7	26.5
State added in 1917 (Tennessee)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	18.2	21.0	21.2	20.4	19.9
States added in 1918 (Illinois, Louisiana, Oregon)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	20.2	17.1	18.9	16.1
States added in 1919 (Delaware, Florida, Mississippi)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	23.3	25.8	24.7
State added in 1920 (Nebraska)	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	17.0	16.2

[1] Includes District of Columbia; excludes registration cities in nonregistration States.
[2] Massachusetts, New Jersey, District of Columbia, Connecticut, New Hampshire, New York, Rhode Island, Vermont, Maine, Michigan, Indiana.
[3] California, Colorado, Maryland, Pennsylvania.
[4] Dropped from area.

TABLE 33.—*Maternal mortality rates in the original death-registration area and in each addition to the area, 1900–1921*—Continued

Area	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921
	DEATH RATES PER 100,000 POPULATION																					
	PUERPERAL SEPTICEMIA																					
Death-registration States (includes District of Columbia)	5.8	5.5	5.2	5.4	6.5	6.3	6.1	6.5	6.7	6.5	7.0	7.1	6.2	7.0	6.8	6.1	6.5	6.8	6.3	5.7	6.5	6.7
States in area in 1900 [2]	5.8	5.5	5.2	5.4	6.5	6.3	5.8	6.4	6.1	6.1	6.7	7.1	6.0	6.6	6.5	5.9	6.1	6.4	5.6	5.2	6.1	6.1
States added in 1906 exclusive of South Dakota [3]							6.7	6.6	8.3	7.4	7.6	6.9	6.5	7.6	7.2	6.5	6.8	6.7	7.0	5.8	6.5	7.0
South Dakota							4.1	3.4	4.9	4.6	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
States added in 1908 (Washington, Wisconsin)									5.8	5.3	6.0	6.0	4.1	6.0	5.0	5.3	5.6	5.3	5.1	3.9	4.6	5.8
State added in 1909 (Ohio)										7.3	8.0	7.5	6.8	7.0	7.9	5.7	7.3	7.7	7.1	5.7	7.3	7.4
States added in 1910 (Minnesota, Montana, Utah)											6.0	7.3	5.4	6.0	6.0	5.2	5.8	7.3	6.2	5.5	6.8	6.7
States added in 1911 (Kentucky, Missouri)												8.1	7.5	8.7	8.2	6.8	6.7	7.9	7.2	6.6	7.2	7.8
State added in 1913 (Virginia)														6.7	8.3	7.3	7.6	8.5	7.2	5.5	6.4	6.9
State added in 1914 (Kansas)															4.3	5.3	8.1	7.5	9.6	6.5	7.7	6.7
States added in 1916 (North Carolina, South Carolina)																	7.2	6.9	7.4	6.7	7.1	6.9
State added in 1917 (Tennessee)																		7.5	6.7	8.2	7.6	8.3
States added in 1918 (Illinois, Louisiana, Oregon)																			5.6	6.1	6.7	6.8
States added in 1919 (Delaware, Florida, Mississippi)																				6.3	8.4	8.1
State added in 1920 (Nebraska)																					5.8	6.6
	ALL OTHER PUERPERAL CAUSES																					
Death-registration States (includes District of Columbia)	7.6	7.7	7.4	7.7	8.4	8.2	9.0	9.0	8.8	8.5	8.4	8.4	8.3	8.5	8.6	8.8	9.5	9.7	15.8	11.1	12.4	10.0
States in area in 1900 [2]	7.6	7.7	7.4	7.7	8.4	8.2	8.6	8.6	8.2	8.3	8.4	8.4	8.2	8.4	8.8	8.8	8.7	9.1	14.9	10.1	11.5	9.0
States added in 1906 exclusive of South Dakota [3]							9.7	9.8	10.0	10.0	9.5	8.8	8.7	9.3	8.9	9.2	9.4	9.2	17.6	10.4	12.1	9.6
South Dakota							9.7	9.2	7.6	8.4	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
States added in 1908 (Washington, Wisconsin)									9.0	7.5	7.3	7.7	7.9	6.5	7.0	7.3	7.9	8.0	10.7	8.2	11.4	8.2
State added in 1909 (Ohio)										6.8	7.2	7.2	7.5	6.6	7.5	7.6	7.9	8.0	14.4	8.9	9.6	8.4

States added in 1910 (Minnesota, Montana, Utah)											7.3	7.8	8.3	9.3	8.1	9.2	9.1	9.1	16.5	12.3	12.4	8.4
States added in 1911 (Kentucky, Missouri)												9.3	8.6	8.1	7.6	7.5	8.1	8.0	12.6	8.6	8.0	7.9
State added in 1913 (Virginia)														12.3	14.2	14.0	13.5	13.6	22.5	16.3	18.1	14.0
State added in 1914 (Kansas)															8.0	7.8	8.8	9.3	15.8	10.5	11.1	8.3
States added in 1916 (North Carolina, South Carolina)																	19.8	19.1	25.9	21.3	25.6	19.6
State added in 1917 (Tennessee)																		10.7	14.3	13.0	12.8	11.6
States added in 1918 (Illinois, Louisiana, Oregon)																			14.5	10.9	12.2	9.3
States added in 1919 (Delaware, Florida, Mississippi)																				17.1	17.4	16.6
State added in 1920 (Nebraska)																					11.1	9.6

[2] Massachusetts, New Jersey, District of Columbia, Connecticut, New Hampshire, New York, Rhode Island, Vermont, Maine, Michigan, Indiana.
[3] California, Colorado, Maryland, Pennsylvania.
[4] Dropped from area.

This method does not take into account, however, changes in rates in the States which were added to the original registration area. In most of the added States, but not in all, the rate from all puerperal causes in 1921 was higher than in the year of admission.

A second method, taking into account changes in mortality rates within the added as well as within the original territory and giving to each change its due weight in the calculation, is as follows: The percentage of change in rate from each year to the next in the territory common to both years is first ascertained. The initial rate in 1900 is multiplied by the percentage of change from 1900 to 1901 in the territory common to both years; the result is then multiplied by the percentage of change from 1901 to 1902 in the territory common to these years; and similarly each successive result is multiplied by the corresponding percentage of change. The final result is a series of adjusted figures which measure the change in maternal mortality in the expanding area after the influence of differences in initial rates in the added States is eliminated. The series of figures so constructed is compared in Table 34 with the rates in the expanding area and with those in the original registration States. A comparison of these three groups of figures shows that eliminating the influence of the expansion of the area gives a trend not far different from the trend of the rates from puerperal causes in the original registration States.

TABLE 34.—*Trend of maternal mortality rates; United States death-registration area, 1900–1921*

Year	Maternal mortality rates per 100,000 population		Ratio to 1900 rate [3]		Index number of rates in expanding area
	Expanding death-registration area [1]	Original death-registration States [2]	Expanding death-registration area	Original death-registration States	
1900	13.4	13.4	100.0	100.0	100.0
1901	13.2	13.2	98.8	98.8	98.8
1902	12.6	12.6	94.0	94.0	94.0
1903	13.1	13.1	97.5	97.5	97.5
1904	14.9	14.9	110.8	110.8	110.8
1905	14.6	14.6	108.8	108.8	108.8
1906	15.0	14.4	111.9	107.1	106.9
1907	15.5	15.1	115.4	112.3	110.4
1908	15.5	14.3	115.9	106.9	111.5
1909	15.0	14.4	112.2	107.6	108.6
1910	15.4	15.1	114.5	112.5	111.8
1911	15.5	15.5	115.8	115.6	111.6
1912	14.4	14.1	107.7	105.4	103.8
1913	15.5	14.9	115.3	111.5	110.2
1914	15.4	15.4	115.2	114.5	110.6
1915	14.8	14.8	110.5	110.0	106.2
1916	16.0	14.8	119.6	110.0	109.9
1917	16.5	15.5	123.0	115.2	112.6
1918	22.1	20.5	165.0	153.1	152.7
1919	16.8	15.3	125.5	113.8	114.5
1920	19.0	17.5	141.5	130.8	129.3
1921	16.7	15.1	124.5	112.6	113.8

[1] Exclusive of cities in nonregistration States.
[2] Includes the six New England States, New York, New Jersey, District of Columbia, Indiana, and Michigan.
[3] The 1900 rates equal 100.

The decrease in the birth rate is a second factor which must be considered before definite conclusions can be drawn; since the birth rate decreased during the years from 1900 to 1920, the maternal mortality rate, when expressed in terms of deaths per 1,000 births, would show a greater increase than when expressed in terms of deaths per 100,000 population. To estimate the influence of the fall in the birth rate upon the apparent changes in rates of puerperal mortality, it is necessary first to ascertain the amount of this fall; with this information its influence upon the puerperal mortality rate as stated in terms of population can easily be calculated.[2]

The chief difficulty in making a correction for the fall in birth rates is to ascertain the rates themselves. The registration of births in many of the States composing the death-registration area of 1900 is incomplete, and statistics based upon registered births during the period from 1900 to 1920 are subject, therefore, to errors of varying size due to omissions. Perhaps the most satisfactory method is to estimate the average number of births for the five years preceding each census date, 1900, 1910, and 1920, from the enumerated populations under 5 years of age and the statistics of deaths of children under 5.[3] This method gives estimated birth rates for the original death-registration States of 25.6 in 1900, 24 in 1910, and 23.2 in 1920; the birth rate, therefore, appears to have decreased 9.4 per cent during these years. Assuming that these estimates give a fairly accurate picture of the fluctuations in the actual birth rates during this period, Table 35 indicates the trend, after allowance is made for the falling birth rate, of maternal mortality in the original death-registration States from all puerperal causes, from puerperal septicemia, and from other puerperal causes.

As would be expected, the result of this correction is to make still larger the apparent increase in mortality from puerperal causes. The rapid fall shown in the crude death rates from 1900 to 1902 appears to be caused in large part by the markedly lower birth rates in the years 1901 and 1902 as compared with that in 1900, which was unusually high. The decrease in mortality from puerperal septicemia from 1911 to 1921, which in the crude figures appeared to be 14.8 per cent, was reduced, after allowance was made for the falling birth rate, to 11.9 per cent. The conclusion is justified, therefore, that

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[2] If B_1 and B_2 are birth rates in different years, and $b=\frac{B_2}{B_1}$ (i. e., the proportion that the second birth rate is of the first) and p_1 and p_2 are the rates of puerperal mortality per 100,000 population in the same years, then if p_2 is divided by b the result will be comparable with p_1 so far as any change in birth rate is concerned.

[3] The number of births during the five-year period prior to the date of the census can be approximated by adding to the enumerated population under 5 years of age the number of children born during that period who died prior to the date of the census. The latter number is approximately equal to the sum of the following: (1) Infants who had died under 1 year of age in the four years prior to the date of the census and 71 per cent of those who had died under 1 year of age in the fifth year before the date of the census; (2) children who had died at 1 year of age during the three years prior, and 59 per cent of those who had died at 1 year of age in the fourth year prior to the date of the census; (3) children who had died at 2 years of age during the two years prior, and 53 per cent of those who had died at this age in the third year prior to the date of the census; (4) children who had died at 3 years of age during the year immediately prior, and 52 per cent of those who had died at this age in the second year prior to the date of the census; (5) 52 per cent of the children who had died at 4 years of age in the year immediately prior to the census date. By this method estimates of births were made for the periods 1895–1899, 1905–1909, 1915–1919; the deaths of infants under 5 years in the years 1895–1899 were estimated from those in the period from 1900–1904 by reducing them in the same proportion that the estimated number of births in 1895–1899 was less than the estimated number of births in 1900–1904. From these figures birth rates for each year from 1900 to 1920 were calculated on the assumption of a uniform rate of fall; these were then modified to take account of fluctuations in the birth rate from year to year by multiplying by a factor found by dividing the actual number of registered births in each year by one-fifth the sum of the actual number of registered births in the five-year period in which the particular year was the middle one. In this calculation no allowance was made for omissions from the census population under 5 years of age nor for variations in the proportion of such omissions.

though, since 1911 at least, the mortality from puerperal septicemia in the original death-registration States has actually decreased, the trend of the rates from "other puerperal causes" appears even more definitely upward than would be inferred from the crude figures.

TABLE 35.—*Trend in maternal mortality rates after allowance is made for falling birth rate; United States death-registration States of 1900, 1900–1921*

Year	Trend in birth rates [1]	Trend in death rates [1]					
		All puerperal causes		Puerperal septicemia		Other puerperal causes	
		Crude figures	Adjusted for falling birth rate	Crude figures	Adjusted for falling birth rate	Crude figures	Adjusted for falling birth rate
1900	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1901	96.5	98.8	102.4	95.3	98.8	101.4	105.0
1902	96.1	94.0	97.9	91.8	94.5	96.5	100.4
1903	97.4	97.5	100.2	94.0	96.5	100.2	102.9
1904	95.8	110.8	115.6	112.2	117.1	109.6	114.5
1905	93.6	108.8	116.2	109.9	117.4	107.9	115.3
1906	95.8	107.1	111.8	100.3	104.7	112.3	117.1
1907	97.0	112.3	115.8	111.6	119.6	112.8	116.3
1908	97.4	105.9	109.7	106.3	109.1	107.4	110.2
1909	92.6	107.6	116.2	106.1	114.6	108.7	117.4
1910	93.8	112.5	120.0	116.5	124.3	109.5	116.7
1911	94.3	115.6	122.6	123.3	130.8	109.8	116.4
1912	93.4	105.4	112.9	103.3	110.6	107.1	114.6
1913	92.4	111.5	120.6	113.5	122.8	109.9	119.0
1914	93.8	114.5	122.0	113.3	120.8	115.3	122.9
1915	92.8	110.0	118.5	102.4	110.3	115.7	124.7
1916	92.3	110.0	119.2	105.6	114.4	113.3	122.8
1917	95.0	115.2	121.2	110.4	116.2	118.9	125.1
1918	94.0	153.1	162.8	97.2	103.3	195.4	207.8
1919	86.5	113.8	131.6	89.7	103.7	132.1	152.7
1920	90.5	130.8	144.4	104.7	115.7	150.5	166.2
1921	91.2	112.6	123.4	105.1	115.2	118.3	129.6

[1] The 1900 rates equal 100.

The improvement in the certification of causes of death during the period from 1900 to 1920 is the third factor which must be taken into account in determining whether the mortality from puerperal causes is actually increasing. The results of the campaign for securing more accurate reporting of causes of death and of the querying of unsatisfactory causes reported have been to make the statistics for the later years more nearly correct than those for the earlier years of the period.

So far as mortality from puerperal septicemia is concerned, the first inquiries related to deaths in 1911, and in that year the death rate from puerperal septicemia reached its maximum. Since in the changes made as a result of the inquiries the cases added to puerperal septicemia have always exceeded the cases subtracted from it, the decrease in the rate since that year points to an improvement in mortality from this cause. The real improvement is greater than appears on the face of the figures because it is in part masked by the continual betterment of certification resulting from extension of the system of querying unsatisfactory certifications of cause.

The influence of the improvement in accuracy of certification, so far as the net additions made to puerperal deaths as a direct result of letters of inquiry to physicians are concerned, may be eliminated by subtracting the additions. The number of cases added is given in Mortality Statistics for the entire death-registration area for each

year since 1911, with the exception of 1912, 1913, and 1918. Table 36 shows the trend in the rates of puerperal mortality corrected to eliminate all cases added as a direct result of letters of inquiry. As would be expected, the index numbers for the later years are slightly reduced by this procedure.

This method of correction, however, obviously can not eliminate additions resulting indirectly from the system of letters of inquiry because of the fact that physicians who have received such letters are likely to be more careful afterwards in reporting causes of death.

TABLE 36.—*Trend in maternal mortality rates after the elimination of additions resulting directly from letters of inquiry; original death-registration States, 1900–1921* [1]

Year	Trend in maternal death rate [2]					
	All puerperal causes		Puerperal septicemia		Other puerperal causes	
	Adjusted for falling birth rate [3]	Corrected [4]	Adjusted for falling birth rate [3]	Corrected [4]	Adjusted for falling birth rate [3]	Corrected [4]
1900	100.0	—100.0	100.0	100.0	100.0	100.0
1911	122.6	122.4	130.8	130.5	116.4	116.2
1912	112.9	112.9	110.6	110.6	114.6	114.6
1913	120.6	120.6	122.8	122.8	119.0	119.0
1914	122.0	121.0	120.8	119.1	122.9	122.4
1915	118.5	117.0	110.3	108.1	124.7	123.7
1916	119.2	117.4	114.4	112.8	122.8	121.0
1917	121.2	117.6	116.2	112.1	125.1	121.7
1918	162.8	[5]	103.3	[5]	207.8	[5]
1919	131.6	129.2	103.7	101.1	152.7	150.6
1920	144.4	141.9	115.7	113.0	166.2	164.0
1921	123.4	120.9	115.2	112.4	129.6	127.3

[1] For basic figures upon which factors for correction are based, see p. 13. Figures for 1901 to 1910 are omitted, since no additions were made and no statistics of such additions were published.
[2] Rate in 1900 equals 100.
[3] From Table 35.
[4] The corrected figures are found by multiplying the adjusted figures by a factor of correction found by dividing the deaths originally certified as puerperal (in the entire death-registration area) by the total of deaths finally so classified.
[5] Figures for additions in 1918 not available.

The influence of the increasing accuracy in certification which is reflected in a decrease in the proportion of deaths classified as due to ill-defined and unknown causes may be estimated and eliminated, so far as transfers from these indefinite to puerperal causes are concerned. In 1900 the proportion of deaths from ill-defined and unknown causes in the death-registration States was 3.8 per cent, and in 1920 in the same area it was only 0.2 per cent. In 1921 only 942 deaths in this area were classified as due to ill-defined and unknown causes, as compared with 13,199 that would have been so classed if the proportion that prevailed in 1900 had prevailed also in 1921. In 1900, of the deaths from these indefinite causes 2.8 per cent were of women between the ages of 10 and 50 years. Assuming that an equal proportion of these deaths were connected with pregnancy or childbirth as the puerperal deaths formed of the total deaths between these ages from known causes (11.7 per cent), then it may be estimated that 0.33 per cent of the total deaths from ill-defined causes were maternal. On this assumption the number probably added to puerperal deaths

by transfer from ill-defined causes has been estimated. The trend in the rates after eliminating these estimated additions, as well as the additions resulting directly from letters of inquiry, is shown in Table 37. As would be expected, this correction still further reduces, though but slightly, the index numbers of rates in the later as compared with the earlier years of the period.

TABLE 37.—*Trend in maternal mortality rates after the elimination of additions resulting directly from letters of inquiry and estimated additions transferred from ill-defined and unknown causes; United States death-registration States as of 1900, 1900–1920*

Year	Trend in maternal mortality rate [1]					
	All puerperal causes		Puerperal septicemia		Other puerperal causes	
	Crude [2]	Corrected [3]	Crude [2]	Corrected [3]	Crude [2]	Corrected [3]
1900	100.0	100.0	100.0	100.0	100.0	100.0
1901	102.4	102.1	98.8	98.6	105.0	104.7
1902	97.9	97.6	94.5	94.2	100.4	100.1
1903	100.2	99.7	96.5	96.0	102.9	102.5
1904	115.6	115.0	117.1	116.4	114.5	113.9
1905	116.2	115.6	117.4	116.7	115.3	114.7
1906	111.8	111.1	104.7	104.0	117.1	116.5
1907	115.8	115.0	119.6	118.6	116.3	115.5
1908	109.7	108.9	109.1	108.2	110.2	109.5
1909	116.2	115.3	114.6	113.6	117.4	116.5
1910	120.0	118.9	124.3	123.2	116.7	115.7
1911	122.4	121.1	130.5	129.1	116.2	115.0
1912	112.9	111.5	110.6	109.2	114.6	113.4
1913	120.6	119.3	122.8	121.3	119.0	117.7
1914	121.0	119.7	119.1	117.8	122.4	121.2
1915	117.0	115.7	108.1	106.7	123.7	122.5
1916	117.4	116.0	112.8	111.4	121.0	119.7
1917	117.6	116.3	112.1	110.1	121.7	120.5
1918	(4)	(4)	(4)	(4)	(4)	(4)
1919	129.2	127.9	101.1	98.9	150.6	149.4
1920	141.9	140.6	113.0	111.6	164.0	162.7

[1] 1900 rate equals 100.
[2] The figures for 1900 to 1910 are the adjusted figures of Table 35, p. 52; from 1911 to 1920 the corrected figures of Table 36, p. 53.
[3] The corrected figures are found by multiplying the "crude figure" in columns 1, 3, and 5 by a factor of correction for estimated transfers from ill-defined and unknown causes as explained in the text, p. 53.
[4] Figures for additions in 1918 not available.

Neither of the preceding methods, however, takes account of improvements due to the campaign for better certification of causes of death, so far as they have reduced the mortality ascribed both to such poorly defined terms as septicemia and convulsions and to terminal conditions such as peritonitis and nephritis, the true or underlying cause of which may be puerperal. An estimate of the effect of such improvements in certification can be made on the following assumptions: First, that the excess in the actual number of female deaths in the age group 15 to 49 over the number expected if the ratio of female to male deaths at these ages were the same as the average ratio of female to male deaths under 15 and over 50 years of age, represents transfers from causes of death peculiar to women; and second, that 80 per cent of these were transfers from puerperal causes.[4] On the basis of these assumptions the total

[4] Of all deaths from 10 to 49 years of age from causes peculiar to women 77.5 per cent were puerperal in 1900 and 80.1 per cent in 1920; 80 per cent is taken as a rough approximation to an average percentage.

number of maternal deaths including those ascribed to poorly defined terms and terminal conditions in each year from 1900 to 1920 has been calculated; and Table 38 gives the rates based upon a comparison of these deaths with the estimated births to indicate the trend in maternal mortality after allowance is made for improvements in certification in these cases.

TABLE 38.—*Estimated trend in maternal mortality rates after allowance is made for improvement in certification of causes of death; United States death-registration States of 1900, 1900–1920* [1]

Year	Estimated death rates per 1,000 live births					
	All puerperal causes		Puerperal septicemia		Other puerperal causes	
	Rate	Trend [2]	Rate	Trend [2]	Rate	Trend [2]
1900	8.5	100.0	4.3	100.0	4.2	100.0
1901	8.0	94.3	3.7	86.8	4.3	101.9
1902	7.4	86.8	3.6	83.2	3.8	90.4
1903	7.0	82.1	3.3	78.2	3.6	86.1
1904	7.9	92.6	3.9	91.0	4.0	94.2
1905	8.0	94.2	3.8	88.1	4.2	100.5
1906	7.1	83.5	3.2	73.8	3.9	93.2
1907	7.2	85.0	3.3	77.8	3.9	92.3
1908	6.7	79.2	3.0	71.1	3.7	87.4
1909	7.0	82.6	2.9	69.0	4.1	96.4
1910	6.9	81.0	3.1	72.8	3.8	89.4
1911	7.0	82.5	3.2	75.4	3.8	89.6
1912	6.5	76.6	2.7	63.0	3.8	90.3
1913	6.8	80.0	2.9	67.6	3.9	92.4
1914	7.1	83.2	2.9	68.0	4.2	98.5
1915	6.9	81.2	2.6	60.9	4.3	101.8
1916	6.7	78.8	2.7	63.0	4.0	94.8
1917	6.6	78.3	2.8	64.8	3.9	91.9
1918	9.3	109.2	2.5	58.2	6.8	160.8
1919	7.5	88.2	2.4	57.4	5.0	119.5
1920	7.8	91.8	2.7	64.0	5.1	120.0

[1] For method of calculation, see p. 54. The allowance made is for estimated additions to puerperal deaths from ill-defined and unknown causes and from peritonitis, septicemia, convulsions (unqualified), acute nephritis, and Bright's disease.
[2] The 1900 rates equal 100.

The trend in the maternal mortality rates after allowance has been made for transfers from these five poorly defined terms and terminal conditions is strikingly different from that shown in preceding tables. From all causes the trend appears to have been very slightly downwards, the highest rate, with the exception of that for 1918 when influenza was a factor, being for 1900. The trend of mortality from puerperal septicemia, however, appears to have been sharply downward throughout the period, the figures indicating a decrease of 36 per cent during these years. From other puerperal causes the rates appear to have been fairly uniform except in 1918, 1919, and 1920, when they were abnormally high.

The validity of these conclusions rests obviously upon the validity of the method of estimate of the number of puerperal deaths roughly classified in past years as due to poorly defined and terminal, rather than causal conditions. In support of the method it should be mentioned that marked decreases in mortality from "septicemia," "peritonitis," and "convulsions (unqualified)" have occurred during the 20-year period, and that, in part at least, deaths from these causes have been transferred to puerperal septicemia and other

puerperal causes. Furthermore, some such improvement would be expected in view of the experience of other countries, and especially in view of the marked improvement in standards of medical education and medical licensure in this country.

The figures, therefore, raise a strong presumption that the mortality from puerperal septicemia actually decreased throughout the period from 1900 to 1920, while that from other puerperal causes remained approximately the same.

COMPARISON OF MATERNAL MORTALITY IN THE UNITED STATES AND IN CERTAIN FOREIGN COUNTRIES

COMPARATIVE MATERNAL MORTALITY RATES

Comparative maternal mortality rates per 1,000 live births in 1920 are shown in Table 39 for countries for which statistics are available. Though the comparability of the figures must be studied before any final conclusion can be drawn it is evident on the face of the figures that the United States ranked among the countries with the highest rates, such as New Zealand and Chile. The mortality in England and Wales, Ireland, and Germany occupied an intermediate position, and that in the Netherlands, Norway, Sweden, and Denmark was low. The relative positions of the rates for the different countries have not changed materially from year to year. (See Table 42.)

TABLE 39.—*Maternal mortality rates in certain countries, 1920* [1]

Country	Deaths from puerperal causes per 1,000 live births, 1920			Country	Deaths from puerperal causes per 1,000 live births, 1920		
	All causes	Puerperal septicemia	Other puerperal causes		All causes	Puerperal septicemia	Other puerperal causes
Australia	5.01	1.83	3.17	The Netherlands	2.42	0.84	1.58
Belgium	6.09	2.62	3.47	New Zealand	6.48	2.24	4.24
Chile [2]	7.48	2.09	5.39	Norway (1918)	2.97	.82	2.15
Denmark	2.35	1.34	1.01	Spain	5.01	3.10	1.91
England and Wales	4.33	1.81	2.52	Sweden (1918)	2.58	1.26	1.31
Finland	3.60	[3]	[3]	Scotland	6.15	1.77	4.38
France (1915)	6.64	3.30	3.34	Switzerland	[3]	2.89	[3]
Germany (1919)	5.15	2.86	2.29	Union of South Africa	4.10	1.93	2.16
Ireland	5.53	1.66	3.87	United States	7.99	2.67	5.32
Italy	3.67	1.41	2.26	Uruguay	3.38	2.06	1.32
Japan	3.53	1.33	2.20				

[1] Compiled from official statistical publications of the several countries. Figures for 1920 unless otherwise indicated.

[2] According to figures given in Appendix D, p. 120, the proportion of deaths in Chile which are certified by physicians is unusually small; in this respect the figures for Chile are not comparable with those for the other countries. Nevertheless, the unusually high mortality from all puerperal causes for Chile indicated by these figures may easily be understated; the division of the mortality between puerperal septicemia and other puerperal causes is probably not significant. See in this connection discussion in Appendix D of the sources of error in the statistics.

[3] Not available in source.

The mortality from puerperal septicemia in the United States was somewhat more favorable, as compared with that in other countries. In 1920 the rate for this country was lower than the rates for Switzerland, Spain, Germany (1919), or France (1915), and nearly equal to that for Belgium. On the other hand, it was over three times the rates in Norway and the Netherlands; over twice the rates in Sweden and Japan; and almost twice the rate in Denmark.

The mortality from other puerperal causes in the United States was equaled only by that in Chile, although New Zealand and Scotland had rates not far behind. On the other hand, the rates from these other causes for the Netherlands, Sweden, and Denmark, to mention only a few countries, were relatively very low.

SIGNIFICANCE OF DIFFERENCES IN RATES

Comparability of the statistics.

A full discussion of the comparability of statistics in the United States and foreign countries is given in Appendix D; the principal conclusions of this discussion, however, may be summarized here. So far as the definitions of "puerperal causes" as a group are concerned, the various countries either use the International List of Causes of Death in which the puerperal causes are defined in equivalent terms in the several languages, or they have lists of their own, in which, though puerperal septicemia and other consequences of pregnancy and childbirth usually are given separately, the two groups appear to be together equivalent to the puerperal causes of the International List.[1] So far as the classification of joint causes is concerned the countries using the International List (except England and Wales) follow presumptively the rules laid down by the International Commission (see p. 122); and the rules followed in other countries, for example, those in Germany quoted in Appendix D (see p. 123), may be considered roughly comparable in their results. A detailed study of the results of applying the United States instead of the English rules to the deaths in England and Wales in 1920 indicates that the rate in England and Wales would have been increased by about 15 per cent if the United States rules had been applied. (See p. 130.)

Equally important is the question of the accuracy of the reports of causes of death. In the preceding discussion of the accuracy of the rate in the United States the most significant test was the study of the relative incidence of male and female deaths from the poorly defined terms septicemia and convulsions, and from the terminal conditions, peritonitis, and acute and chronic nephritis. Table 40 presents the results of a similar test of the statistics of the countries for which maternal mortality rates are shown. The percentage which the estimated excess of female deaths from these five causes formed of the deaths classified as puerperal was higher than in the United States in only two European countries, Norway and Holland; it is significant, however, that in these two countries the puerperal mortality rates were extremely low and that the estimated transfers were largely from septicemia and peritonitis. Nevertheless, even after allowing for an increase in mortality from puerperal septicemia in these two countries of 25, or even 50, per cent, their rates were still less than half that in the United States.[2] In general, this test does not reveal such inaccuracies in the present certification of causes in these foreign countries as were found in the United States, for example, in 1900. Therefore in spite of some differences in the significance of the statistics of these countries the conclusion seems justified that the high rates in the United States both from puerperal septicemia and from other puerperal causes indicate conditions which are less favorable to safe maternity than those which are found in other countries.

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[1] For countries using the International List see p. 118.

[2] In Norway the further correction needs to be made that only causes of deaths certified by physicians are included in the tables showing causes of death. In 1917, of the deaths of women from 15 to 50, 93.7 per cent were certified by physicians. (See p. 66.) In 1918, of 188 puerperal deaths, 155 (82.4 per cent), were certified by physicians. See Sundhetstilstanden og Medisinalforholdene, 1918, Norges Offisielle Statistikk, p. 21*.

TABLE 40.—*Estimated omissions from puerperal deaths on account of inaccurate returns under septicemia, peritonitis, acute or chronic nephritis, and convulsions in certain countries*

Country	Puerperal deaths	Estimated excess of actual over expected[1] female deaths from—						
		All five causes		Septicemia	Peritonitis	Acute nephritis	Chronic nephritis	Convulsions
		Number	Per cent					
England and Wales (1922)	2,971	75	2.5	----------	8	67	----------	--------
Norway (1918)	188	53	28.2	23	15	15	----------	--------
Scotland (1922)	759	51	6.7	5	----------	23	23	--------
Ireland (1920)	550	15	2.7	----------	4	11	----------	--------
The Netherlands (1921)	443	100	22.6	56	41	3	----------	--------
Chile (1921)	1,170	34	2.9	----------	----------	2	32	--------
Uruguay (1921)	129	46	35.7	18	3	14	11	--------
Japan (1921)	7,181	4,290	59.7	231	2,126	557	1,376	--------
Australia (1922)	621	23	3.7	23	----------	----------	----------	--------
New Zealand (1918)	134	13	9.7	----------	4	----------	9	--------
United States death-registration area (1920)	16,776	1,899	11.3	72	269	263	1,295	--------

[1] Expected at average ratio of female to male deaths under 15 and over 50 years of age.

Differences in prevalence of important causal factors.

Among the conditions which might explain such differences in the maternal mortality rates should be considered: (1) Variations in the ages of mothers at the time of childbirth; (2) possible racial differences, as in susceptibility or resistance to infection or prevalence of contracted pelvis due to rickets in infancy; and (3) differences in the quality of care received.

Age of mother.—In the United States the lowest mortality was found among mothers between 20 and 25 years of age, and the mortality among mothers between 15 and 30 was below the average for all ages. (See p. 33). If an unusually large proportion of the mothers in Norway or Italy, for example, were of these ages for which the maternal mortality rates appear to be low, their low average rates might be accounted for in part by this unusually favorable age composition.

The percentages of births to mothers between 15 and 30 years of age, the ages for which the maternal mortality rates are less than average, are shown in Table 41 for the countries for which such figures are available. The figures indicate that the United States had a larger proportion of births to mothers of the ages when mortality is lowest than had any of the other countries for which figures could be obtained.[3] In other words, the high mortality in this country is found in spite of the unusually favorable ages of the mothers.

To make the comparison more concrete, if the mothers of infants born in the United States in 1920 had had the same age distribution as, for example, those of infants born in Norway in 1916 the maternal mortality rate in this country, at the same rates as actually prevailed at each age, would have averaged 8.9 instead of 8. To make a fair comparison of maternal mortality in the United States with that in Norway, therefore, the United States rate should be raised about one-ninth to allow for the unusually favorable ages of the mothers in this country.

[3] The figure for France is almost as favorable as that for the United States.

TABLE 41.—*Percentage of births to mothers between 15 and 30 years of age in certain countries*

Country and year	Live births—		
	Total	To mothers between 15 and 30 years of age	
		Number	Per cent
Australia (1922) [1]	136,056	77,239	56.8
Austria (1913) [2]	886,788	[3] 462,599	52.2
Denmark (1915) [4]	70,841	[3] 39,174	55.3
France (1913) [5]	780,818	482,099	61.7
New Zealand (1920) [6]	29,921	15,797	52.8
Norway (1916) [7]	61,108	28,734	47.0
Sweden (1917) [8]	121,791	[3] 61,540	50.5
United States birth-registration area (1921) [9]	1,714,261	1,078,274	62.9

[1] Summary of Australian Population and Vital Statistics 1922 and Previous Years, p. 94. Australian Demography Bulletin No. 40 (C. S. No. 421). Melbourne, 1923.
[2] Includes both live births and stillbirths. Bewegung der Bevölkerung Österreichs im Jahre 1913, pp. 64, 141.
[3] Includes births to mothers under 30.
[4] Aegteskaber Födte og Döde i Aarene 1911–15, p. 61.
[5] Includes both live births and stillbirths. Statistique du mouvement de la population, 1911–13, pp. 126–127.
[6] Statistics of the Dominion of New Zealand for the year 1920, Vol. I, pp. 36–39.
[7] Folkemengdens bevegelse 1916. Norges Offisielle Statistikk, Series VI, No. 163, pp. 20–21.
[8] Befolkningsrörelsen, år 1917, p. 42–3.
[9] Birth Statistics, 1921, p. 179. The percentage based upon the births of known ages is 64.9.

Racial factors.—No conclusive evidence is available as to whether racial differences in maternal mortality actually exist, but the possibility of their existence may be conceded. The differences in the prevalence of contracted pelvis (see p. 26) might be true racial differences, although more probably they are the consequences of racial customs which influence the prevalence of rickets in infancy. Statistics already presented indicate that in Germany, for example, the percentage of mothers who have contracted pelvis is not far different from that of white mothers in this country. However, the statistics for both countries are limited to a few cities and to clinic or hospital patients, and the figures, therefore, may not be significant of the true relative prevalence of this condition. Nevertheless, so far as the evidence goes it tends to indicate that the low European mortality is not obtained because of any less prevalence of contracted pelvis. No figures are available which could establish the existence of marked differences in case mortality from puerperal septicemia in the principal European nationalities; not only do some cases escape being reported, but the definitions vary as to what cases are to be reported, and it is also probable that the methods of treatment followed vary. So far as other specific factors in puerperal mortality are concerned little or no evidence is available. Even if the existence of racial differences could be proved, before they could be relied upon to account for differences in maternal mortality rates some evidence should be available to indicate that they are such as would tend to explain the actual differences found in the rates. If they tended in a contrary direction they would merely mask differences due to other causes.

Though the possible influence of racial differences upon maternal mortality rates in the several countries is a question upon which it is difficult to throw light certain comparisons can be made which

eliminate the effect of such influence upon comparisons of rates in the United States with those of foreign countries. For example, the rates for mothers of each nationality group in the United States can be compared with those for the mothers of the same nationality in the country of origin. (See p. 42.) Furthermore, comparisons between the rates for certain States, such as Minnesota, in which a large proportion of the population is of Scandinavian stock, and the rates for Norway or Sweden may be made without having to consider the possible influence of racial factors; and comparisons may be made between the maternal mortality rate for the white population of the United States and the rates for England and Wales, Australia, or New Zealand, without consideration of racial factors since the same racial stocks predominate in these populations. All such comparisons tend to indicate higher mortality in the United States than in the other countries with similar racial stocks.

Differences in maternity care.—Differences not due to differences in the statistical methods followed in the several countries nor to differences in such factors as age of mother, or race, are to be explained in terms of differences in maternity care. But it is difficult to bring adequate or satisfactory positive evidence in regard to differences in the kind or quality of maternity care. Light on the subject might be thrown by studies of the relative qualifications of physicians and midwives,[4] of the regulations to which the midwives are subject in the several countries, and of the arrangements for prenatal consultations and for confinement care. A thorough study of these points would be necessary to form sound conclusions, and an inquiry of this kind would fall outside the scope of the present bulletin. Such a study would undoubtedly be especially valuable, not so much for the light it would throw upon the question of the relative quality of maternity care in the several countries, as for the suggestions it would give with regard to the best experience of other countries in dealing effectively with maternal mortality and morbidity.

TREND OF MATERNAL MORTALITY RATES IN CERTAIN FOREIGN COUNTRIES

The trend of maternal mortality rates during the period from 1900 to 1922 in each of the countries for which figures for 1920 have already been presented is shown in Table 42. Conclusions drawn from these figures are, of course, subject to qualification wherever improvement in certification or changes in methods affect the comparability of the data; correction for such improvements or changes would doubtless tend to increase the apparent fall in mortality, or, if the apparent movement of the rates is upward, to lessen the upward movement or to convert it into a downward trend. Such corrections for most of these countries, if made in the way described in a preceding section (see pp. 45–56) would probably not produce so

[4] With regard to qualifications of medical practitioners see Laws (abstract) and Board Rulings Regulating the Practice of Medicine in the United States and Elsewhere (34th Edition, revised to Jan. 1, 1924, American Medical Association, Chicago, 1924). With regard to the licensing and regulation of midwives the principal points of the laws and regulations of certain European countries are summarized in Appendix F; the laws and regulations of the different States in this country are treated briefly on page 76 and given in chart form in Appendix E, page 132). Figures showing the proportion of births attended by physicians and by midwives in certain countries, which are presented in General Table 8, page 148, should be interpreted in the light of these minimum qualifications for the practice of obstetrics.

marked a change in the trend as was found when the correction was made for the United States.

In England and Wales, Finland, Ireland, Japan, Spain, and Switzerland the trend of puerperal mortality during these years appears to have been downward. On the other hand, increases due to improved certification of deaths or to an increased mortality from puerperal causes appear in the rates for Germany, Hungary, Scotland, and Sweden. In Germany and one or two other countries the higher rate for the quinquennium 1915 to 1919 as compared with those for earlier years may have been due to war conditions.

In view of the probable increasing accuracy in certification of causes of death these decreases in the rates in certain countries indicate that in these countries the advance in medical knowledge and the development of public-health control are lessening maternal mortality.

TABLE 42.—*Maternal mortality rates for certain countries, by cause of death; 1900–1922* [1]

Country	Deaths from puerperal causes per 1,000 live births														
	All puerperal causes					Puerperal septicemia					Other puerperal causes				
	1900–1904	1905–1909	1910–1914	1915–1919	1920–1922	1900–1904	1905–1909	1910–1914	1915–1919	1920–1922	1900–1901	1905–1909	1910–1914	1915–1919	1920–1922
Australia	----	5.5	4.9	4.9	4.7	----	1.7	1.7	1.6	1.6	----	3.8	3.2	3.3	3.2
Chile	----	----	7.6	7.6	7.8	----	----	1.4	1.8	2.2	----	----	6.1	5.8	5.6
England and Wales [2]	4.4	3.9	3.7	3.8	[4] 3.9	1.9	1.6	1.4	1.4	[4] 1.6	2.5	2.3	2.3	2.4	[4] 2.3
England and Wales [3]	----	----	[4] 4.0	4.1	4.0	----	----	[5] 1.4	1.4	1.5	----	----	[5] 2.6	2.7	2.5
Finland	4.6	4.1	3.9	3.8	[6] 3.6	----	----	----	----	----	----	----	----	----	----
France	----	[7] 5.3	4.9	6.6	----	----	[7] 2.5	2.4	[8] 3.3	----	----	[7] 2.8	2.5	[8] 3.3	----
Germany	[9] 3.4	3.3	3.5	4.6	----	[9] 1.6	1.4	1.6	2.4	----	[9] 1.8	1.8	1.8	2.2	----
Bavaria	3.8	3.9	3.7	[10] 4.5	----	1.6	1.6	1.5	[10] 1.9	----	2.2	2.4	2.2	[10] 2.6	----
Prussia	3.3	3.1	3.4	4.6	[6] 5.2	[11] 1.6	1.3	1.6	2.5	[6] 3.1	[11] 1.8	1.7	1.8	2.1	[6] 2.1
Hungary	3.6	3.6	3.3	[4] 4.0	----	.9	1.0	1.1	[8] 1.3	----	2.7	2.6	2.2	[4] 2.7	----
Ireland	[12] 5.8	5.4	5.2	5.1	[4] 5.6	[12] 2.1	1.9	1.7	1.7	[4] 2.2	[12] 3.7	3.5	3.5	3.4	[4] 3.4
Italy	2.7	2.8	2.4	[13] 2.8	----	1.0	1.0	.9	[13] 1.0	----	1.7	1.8	1.6	[13] 1.8	----
Japan	4.2	4.2	3.5	3.5	3.5	1.3	1.4	1.4	1.4	1.3	3.0	2.7	2.0	2.2	2.2
Netherlands	2.5	2.4	2.3	2.8	2.4	.8	.7	.7	1.0	.8	1.8	1.7	1.6	1.8	1.7
New Zealand	4.8	4.5	4.0	5.4	5.6	1.1	1.2	1.1	1.8	1.9	3.7	3.3	3.0	3.6	3.7
Norway	3.1	2.8	2.9	3.0	----	1.6	1.4	1.2	1.1	----	1.4	1.4	1.7	1.9	----
Scotland	4.8	5.4	5.8	6.2	6.4	2.0	1.8	1.6	1.6	1.9	2.8	3.5	4.2	4.6	4.4
Spain	5.6	5.9	5.3	5.4	[4] 5.0	3.3	3.8	3.3	3.3	[4] 3.1	2.3	2.1	2.0	2.1	[4] 1.9
Sweden	[9] 2.2	2.4	2.5	[13] 2.8	----	[9] 1.0	.9	1.0	[13] 1.2	----	[5] 1.2	1.5	1.5	[13] 1.4	----
Switzerland	5.8	5.7	5.2	[6] 5.5	----	2.4	2.5	2.3	2.6	[6] 2.9	3.4	3.2	2.9	[8] 3.2	----
Uruguay	2.4	2.3	2.4	2.7	[4] 3.3	1.1	1.4	1.4	1.6	[4] 2.0	1.3	.9	1.0	1.1	[4] 1.3
United States birth-registration area	----	----	----	7.3	7.1	----	----	----	2.5	2.6	----	----	----	4.7	4.5

[1] Compiled from official sources and from Annuaire International de Statistique. Where figures are not filled in, they are not available.
[2] List of causes of death in use prior to 1911.
[3] International list adopted in 1911.
[4] 1920–1921.
[5] 1911–1914.
[6] 1920.
[7] 1906–1909.
[8] 1915.
[9] 1901–1904.
[10] 1915–1916.
[11] 1903–1904.
[12] 1902–1904.
[13] 1915–1918.

PREVENTABILITY OF PUERPERAL MORTALITY

Since puerperal mortality is due to a variety of causes and predisposing conditions preventive measures must be directed toward removing these causes or altering or modifying the conditions, and the preventability of puerperal mortality is measured by the degree to which such measures can be successfully applied. The pathological causes fall into two main divisions: Puerperal septicemia, the prevention of which depends upon the rigorous observance of surgical cleanliness or asepsis, and "other puerperal causes," the prevention of which depends largely upon competent medical supervision and assistance during pregnancy and at confinement.

From the point of view of public-health work the problem of preventability requires not only such general control over medical licensure and the licensing of midwives as to insure that medical practitioners and midwives are adequately trained, but also that facilities shall be available to provide for every mother the skilled medical attention and care which she requires.

Finally, it is important that the mother should be educated to demand competent medical supervision during pregnancy and that she should realize the importance of early consultation with her physician if the presence of certain complications is to be discovered and proper steps taken to minimize the dangers from them. In this connection it may be pointed out that the risk of death in cases of so-called "self-induced" abortions is very high because of the liability to septic infection. Deaths from these abortions, in contrast to those following "criminal" abortions, are included in puerperal deaths.

PUERPERAL SEPTICEMIA

Almost all the mortality from puerperal septicemia is preventable. Puerperal septicemia is infectious in origin, and its prevention depends upon the rigorous observance of asepsis.

The success of aseptic procedures is shown by the experience of well-conducted hospitals in which the mortality has been reduced to a minimum. Thus, in Australia, the Sydney Women's Hospital in 1904 reported 10 years' work with nearly 4,000 cases, and not one death from puerperal sepsis. At the Rotunda Hospital in Dublin, 2,060 women were confined in 1907–8; only 3 died from puerperal sepsis, and in each of these cases the infection occurred outside the hospital. At the York-Road Lying-in Hospital, Lambeth, during 16 years, 8,373 deliveries took place, and not a single death due to infection occurred within the hospital. Prof. O. von Herff in 1907 reported that at his own hospital in Basle, among 6,000 cases confined during the preceding 14 years, not a single woman died of puerperal fever contracted in the hospital, and only 0.8 per 1,000 of the total 6,000 cases died of puerperal fever contracted previous to admission to the hospital.[1]

[1] Maternal Mortality in Childbirth, p. 3. Committee Concerning Causes of Death and Invalidity in the Commonwealth. Australian Department of Trade and Customs, Melbourne, 1917.

Similar results are to be found in American hospital experience. For example, in the hospital and out-patient services of the Chicago Lying-in Hospital, among 11,605 confinements during 1919 to 1923, inclusive, only 5 deaths from puerperal sepsis occurred, and in all but 1 of these 5 cases the delivery took place outside the hospital.[2] At the Swedish Hospital in Minneapolis, among 1,512 cases of pregnancy admitted from November, 1921, to April, 1923, no deaths from puerperal infection occurred.[3]

In regard to the prevention of puerperal septicemia the Australian committee appointed to study the causes of death and invalidity in the Commonwealth states: "Puerperal septicemia is probably the greatest reproach which any civilized nation can by its own negligence offer to itself. It can be prevented by a degree of care which is not excessive or meticulous, requiring only ordinary intelligence and some careful training."[4]

If the prevention of puerperal septicemia in a given case is a matter of attention to rigorous surgical cleanliness (asepsis), its prevention in an entire country, so far as normal confinements are concerned, is primarily a matter of insuring that the requisite procedure not only is familiar to but is practiced by all the persons who are authorized to attend confinements. For this purpose effective supervision by a public-health agency over hospitals, over the training and admittance to practice of physicians, and over midwives and nurses is necessary. Among public-health measures for the control of puerperal septicemia the requirement that it shall be reported like other infectious diseases is of great importance, since if public-health authorities are promptly notified of the occurrence of each case they are in a better position to take necessary precautions and effective steps to prevent the spread of infection.

The preceding statement applies, of course, only to ordinary confinements. In some cases infection occurs before the physician is called or before the patient is received in the hospital. In rare instances, furthermore, even with the most rigorous asepsis on the part of the physician, auto-infection may take place.

With regard to infections following self-induced abortions, prevention is a social rather than a medical problem, since probably in most such cases infection occurs before a physician is called.[5] Unfortunately, very little evidence is available to indicate the proportion of cases of infection which follow self-induced abortion.[6] Nevertheless, except for the rare cases of auto-infection, the conclusion is justified that nearly all the deaths from puerperal septicemia are preventable, since deaths from self-induced abortions are obviously

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[2] Information furnished by the Chicago Lying-in Hospital.

[3] Adair, F. L., M. D., and C. O. Maland, M. D.: "Results gained in maternity cases in which antenatal care has been given," p. 19. Paper read before section on obstetrics, gynecology, and abdominal surgery at the Seventy-fourth Annual Session of the American Medical Association, San Francisco, June, 1923. (Reprinted from Journal of the American Medical Association, Sept. 22, 1923, Vol. 81, pp. 992–998.)

[4] Maternal Mortality in Childbirth, p. 9.

[5] "During my 20 years of active hospital work, having had an unusual opportunity to observe a large number of cases, I never saw a case develop sepsis in whom an abortion had been performed. Now all patients upon whom an abortion is performed in a reputable hospital usually have a definite medical indication for the interruption of pregnancy. It is always a constitutional condition of either an organic or a metabolic nature. The resistance in such cases is very much diminished and the women are therefore more prone to infection; still they pass through the ordeal well and but seldom develop complications. Why, then, do patients upon whom abortions are performed outside of hospitals develop so many complications?" Rongy, A. J.: "A review of the maternal mortality associated with pregnancy and labor in the Bronx during the past 10 years," Medical Record, vol. 99 (Apr. 23, 1921), pp. 691, 696.

[6] In two years in Bronx County of 309 deaths from puerperal sepsis 140 were postabortal. Ibid., p. 693. Of 751 cases in Berlin from 1910 to 1912, 506 (67.4 per cent) followed abortions. Statistisches Jahrbuch der Stadt Berlin, 32 year (1908–1911), p. 143.

unnecessary, and those from septicemia following other confinements can be prevented in almost all cases by the observance of asepsis by the attendants at birth.

The experience of certain countries which have trustworthy statistics covering a considerable period of years shows that puerperal septicemia can be effectively controlled on a large scale. The figures for Norway are particularly impressive. In Norway this disease was early made reportable, and statistics not only of deaths from, but also of cases of, puerperal septicemia are available for a period beginning as early as 1859. The figures for the years from 1876 to 1918, presented in Table 43, show a striking reduction of four-fifths in the case rate and of nearly three-fourths in the death rate during this period.

TABLE 43.—*Decrease in prevalence of and mortality from puerperal septicemia; Norway, 1876–1918* [1]

Year	Cases of puerperal septicemia notified per 1,000 births [2]	Deaths from puerperal septicemia per 1,000 births [2]	Year	Cases of puerperal septicemia notified per 1,000 births [2]	Deaths from puerperal septicemia per 1,000 births [2]
1876	12.60	3.15	1898	5.39	1.56
1877	10.50	2.76	1899	5.29	1.88
1878	8.65	2.13	1900	5.22	1.63
1879	9.32	2.50	1901	4.24	1.48
1880	8.42	2.02	1902	4.98	1.61
1881	8.27	2.09	1903	4.43	1.70
1882	7.11	1.37	1904	5.23	1.63
1883	8.36	2.11	1905	4.05	1.18
1884	7.91	2.25	1906	4.33	1.24
1885	8.10	2.41	1907	4.29	1.48
1886	7.83	2.15	1908	4.33	1.57
1887	9.30	2.66	1909	4.03	1.26
1888	8.14	2.39	1910	4.25	1.23
1889	9.17	2.86	1911	5.04	1.39
1890	8.03	2.48	1912	4.67	1.42
1891	7.20	2.00	1913	3.70	.95
1892	7.35	2.21	1914	3.79	1.12
1893	6.82	2.39	1915	3.85	.92
1894	7.01	2.12	1916	3.33	.98
1895	6.08	1.45	1917	3.78	1.25
1896	5.84	1.90	1918	2.38	.80
1897	5.78	1.77			

[1] Statistisk Arbok for Kongeriket Norge, 1880–1922. Births taken from yearbook for 1900, p. 8, and 1922, p. 26.
[2] Includes stillbirths.

The decrease indicated by these figures, furthermore, is considerably understated owing to the increasing completeness of the statistics of cause of death during the period covered. In Norway, only those deaths the causes of which are stated definitely by physicians are included in the cause-of-death tables; in other words, deaths not certified at all or those which, though certified by physicians, are reported as due to "unknown" causes are omitted from tables dealing with the causes of mortality. But the proportion of all deaths certified by physicians increased from 44.5 per cent in 1876 to 88.9 per cent in 1917.[7] Of the deaths of women of childbearing ages (15 to 50) the proportion certified by physicians was slightly greater than of all deaths so certified (in 1917. 93.7 per cent

[7] C. no. 4, Beretning om Sundhedstilstanden og Medisinalforholdene i Norge i 1876, p. iv, 1917, p. 33*.

as compared with 88.9 per cent), but the increase in the proportion certified was about as great for deaths of women of childbearing ages as for all deaths—namely, from 59.2 per cent in 1876 to 93.7 per cent in 1917.[8]

The mortality from puerperal septicemia in England and Wales shows a marked reduction during the 30 years from 1891 to 1920 (Table 44). The rate fell from 2.60 for the period 1891–1895 to only 1.59 for the period 1916–1920, reaching its lowest points (1.34 and 1.35) in 1913 and 1918, respectively.[9] In commenting upon this decrease Sir Arthur Newsholme calls attention to the enactment in 1902 of the midwives act which was applicable to England and Wales, and shows that during the period immediately following, the rate fell much more rapidly in these two countries than in either Scotland or Ireland (Table 45).[10]

TABLE 44.—*Decrease in mortality from puerperal sepsis; England and Wales, 1891–1920* [1]

Period	Deaths from puerperal sepsis per 1,000 births	Period	Deaths from puerperal sepsis per 1,000 births
1891–1895	2.60	1906–1910	1.56
1896–1900	2.12	1911–1915	1.50
1901–1905	1.95	1916–1920	1.59

[1] Eighty-third Annual Report of the Registrar-General for England and Wales (1920), p. lxxxvi. The classification of causes was that in use before 1911.

TABLE 45.—*Death rates from puerperal fever per 1,000 births; United Kingdom, 1881–1914* [1]

Period	England	Wales, including Monmouth	Scotland	Ireland
1881–1890	2.56	3.11	2.42	2.83
1891–1900	2.22	2.99	2.01	2.62
1901–1902 [2]	2.10	3.24	2.29	2.22
1903–1910	1.62	2.05	1.93	2.04
1911–1914	1.39	1.67	[3] 1.44	2.01

[1] Maternal Mortality in Connection with Childbearing and Its Relation to Infant Mortality. Supplement to the Forty-fourth Annual Report of the Local Government Board, 1914–15, p. 40.
[2] The statistics for the two years 1901–02 are given separately from the rest of the period 1901–1910. The midwives act was passed July 31, 1902. Its terms applied only to England and Wales.
[3] These statistics are for the years 1911–1913.

Figures given in Table 46 show a decrease in the mortality from puerperal septicemia in the Netherlands from a rate of 1.33 per 1,000 births in 1876–1880 to 0.68 in 1921.

[8] Ibid., 1876, p. liv-lv, and 1917, p. 106*–107*; and Statistisk Årbok for Kongeriket Norge, 1880, p. 23, and 1920, p. 19.
[9] Based upon classification in use before 1911. Eighty-third Annual Report of the Registrar-General for England and Wales (1920), p. lxxxvi.
[10] Maternal Mortality in Connection with Childbearing and Its Relation to Infant Mortality. Supplement to the Forty-fourth Annual Report of the Local Government Board, 1914–15, p. 40. Cd. 8085. London. (Reprinted in part in Monthly Review of U. S. Bureau of Labor Statistics, January, 1917, vol. 4, pp. 75–84.)

TABLE 46.—*Decrease in puerperal mortality; the Netherlands, 1876–1921* [1]

Period	Deaths from puerperal causes per 1,000 births		
	Total	Puerperal septicemia	All other puerperal causes
1876–1880	4.08	1.33	2.75
1881–1885	4.08	1.20	2.88
1886–1890	3.59	1.18	2.41
1891–1895	3.02	1.10	1.92
1896–1900	2.50	.69	1.81
1901–1905	2.39	.72	1.67
1906–1910	2.39	.71	1.68
1911–1915	2.24	.66	1.58
1916–1920	2.69	.94	1.75
1921	2.28	.68	1.60

[1] Statistiek van de sterfte naar den Leeftijd en de oorzaken van den Dood over het jaar, 1921, Statistiek van Nederland No. 362, p. xxxvii. 's=Gravenhage, 1922.

The figures in Table 47 are of special interest as a demonstration of what can be done in a large city in this country. The figures show a marked decrease in the mortality from puerperal septicemia in New York City from 1900 to 1921; the rate decreased from 4.1 per 1,000 births in 1900 to a minimum of 2 in 1918, after which it increased slightly to 2.5 in 1921.

TABLE 47.—*Decrease in the maternal mortality rates; New York City, 1900–1921*

Year	Live births [1]	Deaths caused by pregnancy and confinement					
		All puerperal causes		Puerperal septicemia		Other puerperal causes	
		Number	Rate per 1,000 live births	Number	Rate per 1,000 live births	Number	Rate per 1,000 live births
1900	81,721	666	8.1	333	4.1	333	4.1
1901	80,735	636	7.9	292	3.6	344	4.3
1902	85,644	611	7.1	317	3.7	294	3.4
1903	94,755	603	6.4	293	3.1	310	3.3
1904	99,555	759	7.6	385	3.9	374	3.8
1905	103,881	837	8.1	435	4.2	402	3.9
1906	111,772	779	7.0	386	3.5	393	3.5
1907	120,720	832	6.9	413	3.4	419	3.5
1908	126,862	772	6.1	364	2.9	408	3.2
1909	122,975	759	6.2	336	2.7	423	3.4
1910	129,080	802	6.2	376	2.9	426	3.3
1911	134,544	779	5.8	375	2.8	404	3.0
1912	135,655	748	5.5	350	2.6	398	2.9
1913	135,134	733	5.4	338	2.5	395	2.9
1914	140,647	771	5.5	375	2.7	396	2.8
1915	141,256	779	5.5	362	2.6	417	3.0
1916	137,664	728	5.3	314	2.3	414	3.0
1917	141,564	715	5.1	297	2.1	418	3.0
1918	138,046	1,011	7.3	272	2.0	739	5.4
1919	130,377	750	5.8	281	2.2	469	3.6
1920	132,856	864	6.5	306	2.3	558	4.2
1921	134,241	832	6.2	332	2.5	500	3.7
1915	[2] 140,177	779	5.6	362	2.6	417	3.0
1916	[2] 137,923	728	5.3	314	2.3	414	3.0
1917	[2] 141,234	715	5.1	297	2.1	418	3.0
1918	[2] 137,649	1,011	7.3	272	2.0	739	5.4
1919	[2] 130,308	750	5.8	281	2.2	469	3.6
1920	[2] 132,823	864	6.5	306	2.3	558	4.2
1921	[2] 134,058	832	6.2	332	2.5	500	3.7

[1] Annual Report, Department of Health, city of New York.
[2] Birth Statistics, 1915–1921, U. S. Bureau of the Census.

The evidence presented indicates that great progress has been made in certain localities in the control of mortality from puerperal septicemia. If statistics were available for the United States from a period before the nature of the disease and the methods of asepsis were known the present rate doubtless would show a great reduction in comparison with such figures. But the present mortality rates for European countries are much below those for the United States. If the statistics are comparable they suggest, therefore, either that measures for control in these foreign countries are more effective or that the conditions under which they operate are more favorable than in the United States. A careful study of the best methods in use in this country and elsewhere, of public control over hospitals and over the licensing and practice of physicians and midwives (such as, for example, the compulsory reporting of cases of puerperal septicemia) doubtless would reveal ways in which these methods could be improved.

OTHER PUERPERAL CAUSES

Puerperal causes other than septicemia fall into seven main groups: (1) Accidents of pregnancy; (2) puerperal hemorrhage; (3) other accidents of labor; (4) puerperal albuminuria and convulsions; (5) following childbirth (not otherwise defined); (6) puerperal phlegmasia alba dolens, embolus, sudden death; and (7) puerperal diseases of the breast.

The first four groups comprise the great majority (in 1921, 92.9 per cent) of all deaths from puerperal causes exclusive of septicemia. The fifth group includes deaths reported as "following childbirth" and those from puerperal mania. The sixth, "Puerperal phlegmasia alba dolens, embolus, sudden death," contributes a comparatively small number of deaths. Very few deaths are assigned to the seventh group.

Under the term "accidents of pregnancy" are included three causes of death: Ectopic or extra-uterine gestation, abortion or miscarriage, and "other accidents of pregnancy." The first condition is relatively infrequent but requires operative interference and is, therefore, coupled with some extra risk, though with early diagnosis and in skilled hands the case mortality is not high.

Deaths following abortions or miscarriages include those in which the abortion was caused by diseased or abnormal conditions and also those in which it was self-induced, provided in both cases that no infection was reported. An important cause of abortion is syphilis in the mother; most miscarriages due to this cause, however, can be prevented by treatment commenced early in pregnancy. Many miscarriages due to other causes also may be prevented by appropriate treatment.[11] Except where accompanied by infection or hemorrhage, however, abortion or miscarriage is not coupled with a high risk of death for the mother.[12]

Deaths from self-induced abortions in which no infection has occurred, or if it has occurred has not been reported, like those which because of infection are classified under puerperal septicemia, are, of

[11] Adair, Fred L., M. D., and C. O. Maland, M. D.: "Results gained in maternity cases in which antenatal care has been given," pp. 19–21.

[12] Ibid., pp. 9–10. "Aside from the effect on the maternal impulse, the woman suffers no ill effects from the abortion except such as result from certain complications such as hemorrhage or infection."

course, preventable, but prevention is a social rather than a medical problem. Little or no information is available as to the total number of such abortions, the proportion that result in death, or the proportion of the total number of deaths from puerperal causes that follow self-induced abortion.[13]

Among 266 puerperal deaths in Maryland in 1921, based upon a study of death certificates, 13 (4.9 per cent) were due to admittedly self-induced abortion, and 7 of these deaths were classified as due to puerperal septicemia. In Wisconsin in the same year, among the 378 puerperal deaths 14 (3.7 per cent) were cases of admittedly self-induced abortion; 6 of these were classified as due to puerperal septicemia.[14]

The second cause of deaths from "other puerperal causes"—puerperal hemorrhage following labor—according to the report of the Australian Committee is "under hospital conditions no more than a more or less serious incident which in almost all cases can with care be brought under control. The death rate from this condition is a measure of the ignorance of those attending on the patient of the proper measures to be immediately resorted to, and often the degree of ignorance is so complete that the necessity for summoning medical assistance is not realized until it is too late."[15]

Among the causes included under "other accidents of labor" are obstructions due, for example, to the small size or abnormal shape of the pelvic canal. Doctor Meigs states in the Children's Bureau bulletin to which reference has already been made that if this condition is discovered before labor—

> proper treatment will in almost all cases insure the life of mother and child; if it is not discovered until labor has begun, or perhaps until it has continued for many hours, the danger to both is greatly increased. Every woman, therefore, should have during pregnancy—and above all during her first pregnancy—an examination in which measurements are made to enable the physician to judge whether or not there will be any obstruction to labor. A case in which a complication of this kind is found requires the greatest skill and experience in treatment,[16] but with such treatment the life and health of the mother are almost always safe.

Puerperal albuminuria and convulsions, called also eclampsia or toxemia of pregnancy, is a disease which occurs most frequently during pregnancy but which may occur at or following confinement. It is a relatively frequent complication among women bearing their first children. When fully established its chief symptoms are convulsions and unconsciousness. In the early stages of the disease the symptoms are slight puffiness of the face, hands, and feet; headache; albumen in the urine; and usually a rise in blood pressure. Very often proper treatment and diet at the beginning of the early symptoms may prevent the development of the disease; but in many cases where the disease is well established before the physician is consulted, the woman and baby can not be saved by any treatment. In the prevention of deaths from this cause it is essential, therefore, that each woman, especially each woman bearing her first child, should know what she can do, by proper hygiene and diet, to prevent the disease; that

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[13] Figures for the Minneapolis General Hospital in 1922 showed 210 abortions or threatened abortions during a period in which 1,069 births occurred in the hospital, a rate of 1 in every 6; of these abortions 54 (over one-fourth) were admittedly induced. One maternal death occurred in this group of patients. Adair, Fred L., M. D., and C. O. Maland, M. D.: "Results gained in maternity cases in which antenatal care has been given," pp. 19–21.

[14] Dr. Ehlers gives figures for Berlin in 1895–96 indicating that a large percentage (34.3 per cent) of the deaths from puerperal infection followed abortion. Ehlers, Philipp: Die Sterblichkeit "im Kindbett" in Berlin und Preussen, 1877–1896, p. 47. Stuttgart, 1900.

[15] Maternal Mortality in Childbirth, p. 9.

[16] "The public must be taught that the conduct of labor complicated by a moderate degree of pelvic contraction is quite as serious as a case of appendicitis and that its proper management requires the highest degree of judgment and skill, while eclampsia or placenta prævia are even more serious." Williams, J. W.: "The midwife problem and medical education in the United States." Transactions of American Association for Study and Prevention of Infant Mortality, 1911, p. 189.

she should know the meaning of these early symptoms if they arise so that she may seek at once the advice of her doctor; and that she should have regular supervision during pregnancy, with examination of the urine at intervals.[17]

In a study of the results gained by antenatal care in 2,000 maternity cases Doctor Adair and Doctor Maland state: "We feel justified in concluding that maternal, but not fetal, deaths from toxemia may be practically eliminated by adequate antenatal supervision and intervention at the proper time." [18]

The report of the committee appointed to study causes of death and invalidity in the Commonwealth of Australia sums up the situation as follows:

> The principal causes of death are five in number—1. Accidents of pregnancy; 2. Puerperal hemorrhage; 3. Other accidents of labor; 4. Puerperal septicemia; 5. Puerperal albuminuria and convulsions. The results obtained in hospitals or where skilled attention is available, show that these last four causes of death can be almost entirely eliminated. Such a result can be achieved, but it will be achieved only in proportion to the extent to which skilled assistance, properly qualified and properly controlled, is available to all mothers before, during, and after labor.[19]

From official statistical sources, however, little evidence is available as to a decrease in puerperal mortality from other causes than septicemia. In many countries whatever tendency toward decrease in the rate there may be is so slight as to be offset by the tendency toward better certification of causes. Table 48 shows that in England and Wales there occurred a decrease in the mortality from these causes from 2.89 for the period 1891–1895 to 2.18 for 1906–1910, followed by a slight increase to 2.29 for 1916–1920.

TABLE 48.—*Decrease in mortality from puerperal causes (except sepsis); England and Wales, 1891–1920* [1]

Period	Deaths from puerperal causes (except sepsis) per 1,000 births	Period	Deaths from puerperal causes (except sepsis) per 1,000 births
1891–1895	2.89	1906–1910	2.18
1896–1900	2.57	1911–1915	2.31
1901–1905	2.32	1916–1920	2.29

[1] Eighty-third Annual Report of the Registrar-General for England and Wales (1920), p. lxxxvi. The classification of causes was that in use before 1911.

Figures given in Table 49 showing the decrease in the mortality following obstetrical operations in Bavaria and Baden are of interest in this connection, for although much of the decrease in mortality is undoubtedly due to the application of aseptic methods and to a decrease in the incidence of puerperal septicemia, yet operation is usually resorted to in those cases in which the risk of death from other puerperal causes is high. Consequently, a decrease in the mortality attending operative procedures would be likely to mean a reduction in the mortality from these causes.

[17] Maternal Mortality from All Conditions Connected with Childbirth in the United States and Certain Foreign Countries, pp. 12–13.
[18] Adair, Fred L., M. D., and C. O. Maland, M. D., "Results gained in maternity cases in which antenatal care has been given," p. 16.
[19] Maternal Mortality in Childbirth, p. 10.

TABLE 49.—*Decrease in case mortality following specified operations in Baden from 1870–1879 to 1900–1909, and in Bavaria from 1883–1890 to 1901–1906* [1]

Operation	Deaths per 100 cases			
	Baden		Bavaria	
	1870–1879	1900–1909	1883–1890	1901–1906
Placenta prævia	24.8	8.5	22.4	14.7
Instrumental delivery	3.2	.6	2.9	1.3
Version	7.3	2.0	5.6	2.1
Extraction	6.5	.4		
Craniotomy	23.9	5.8	18.3	7.2
Induced premature birth	10.0	2.0	5.8	1.8
Cesarean section	100.0	20.0	84.2	17.7
Premature separation of placenta	6.6	1.3	4.8	3.4

[1] Weinberg, W.: "Kindbettfieber und Kindbettsterblichkeit," p. 589.

The preventability of mortality from puerperal causes other than septicemia is shown in striking fashion, though on a relatively small scale, in the results obtained by intensive prenatal work among small groups of mothers. In New York City, in a study of 8,743 mothers who received prenatal nursing care through the Maternity Center Association of New York City working in cooperation with the Henry Street Settlement, it was found that "the intensive care given to mothers during the period of pregnancy, and especially the emphasis on controlling the albuminurias of pregnancy, brought immediate results. The mortality from eclampsia was so reduced to about one-third of the proportion that usually occurs in the general population from this cause. There were only three maternal deaths definitely ascribed to eclampsia when nine were expected. It is significant also that 95 per cent of the cases which showed albuminuria during pregnancy resulted in full-term delivery. A proportion of only 5 per cent prematurity is a good result for this type of case, coupled with the reduced maternal mortality from toxemia." [20] The maternal mortality rate from all puerperal causes except septicemia in the group of mothers who received prenatal care was only 2.06 per 1,000 births as compared with a rate of 2.84 in Manhattan Borough as a whole.[21]

Information on the results of prenatal nursing in the reduction of maternal mortality may be obtained also from the report of the Committee on Nursing Education.[22] In Boston the Instructive District Nursing Association reported that "the prenatal nursing of the Instructive Nurse Association reduced the maternal death rate for the year 1920 from 7 in every 1,000 births to 2 in every 1,000 births." [23] The Metropolitan Life Insurance Co. "reports that during the period

[20] Dublin, Louis I.: "The mortality of early infancy." Transactions of the Thirteenth Annual Meeting of the American Child Hygiene Association, Albany, 1923, p. 89–90. See also pp 191–192.

[21] Report of the Work of the Maternity Center Association, April, 1918, to Dec. 31, 1921, p. 33. "In passing it may be noted that the stillbirth rate was reduced to one-half and the neonatal mortality rate to three-fourths of the rate of the city." Dublin, L I.: "The mortality of early infancy." Transactions of the Thirteenth Annual Meeting of the American Child Hygiene Association, pp. 90–91.

[22] Nursing and Nursing Education in the United States; report of the Committee for the Study of Nursing Education, p. 49. New York, 1923.

[23] Instructive District Nursing Association; a review by Mary Beard, p. 14. Boston, 1921. "Twenty-eight thousand and thirty-one visits were paid during the year to 4,353 expectant mothers. Twenty-six per cent of this work was carried on for patients of the Boston Lying-In Hospital in cooperation with the Harvard Medical School, 3 per cent for the Jewish Women's Maternity Service Association in cooperation with Tufts Medical School, and the remaining 71 per cent of the service for about 600 private physicians."

from 1911 to 1919, among women between the ages of 29 and 34, whom the nursing service [for its policyholders] especially served in maternity care, the mortality rate was reduced 20.5 per cent, while among women of these ages in the population as a whole, the reduction of the same period was 3.8 per cent." [24]

[24] Frankel, Lee K.: "A decreasing mortality rate." The Public Health Nurse, February, 1921, p. 73.

PREVENTION OF MATERNAL MORTALITY

Authorities are agreed that in order to secure the best results in preventing both the mortality and the morbidity associated with pregnancy and childbirth skilled care must be made available to every mother not only during the period of confinement but also during pregnancy and during the postnatal period immediately following confinement. Furthermore, if such a program is to be effectively realized the mothers themselves must be educated to demand such skilled attendance. Only by competent care and supervision during pregnancy can the condition of the mother be ascertained, the presence of impediments to normal labor be discovered, the onset of dangerous symptoms be recognized, and the appropriate preventive measures be adopted. During confinement the presence of a skilled practitioner with proper qualifications is essential, and if any untoward symptoms develop, medical assistance, if not at hand, must be promptly secured. Supervision during the postnatal period is also necessary to guard against the development of late complications and to insure that the mother is given the best chance for full recovery.

Thus the problem of preventing deaths from puerperal causes resolves itself into a problem of insuring that every mother shall receive skilled assistance. In practice its solution requires not only regulation of the training and qualifications for admission to practice of physicians, midwives, and nurses, supervision over public and private hospitals in which confinement cases are received, and public-health control over puerperal septicemia, but also the education of mothers to demand the proper kind, quality, and amount of skilled attendance.

In this section are presented: (1) A brief statement of those public health laws which establish safeguards for the protection of maternity (laws prescribing minimum qualifications for the practice of obstetrics or midwifery, laws providing for the licensing and inspection of maternity and other hospitals, and laws and regulations for the control of venereal diseases and puerperal septicemia); (2) a summary statement of the available resources in the United States in personnel and facilities for maternity care, and evidence of the extent to which mothers in this country actually receive adequate prenatal, confinement, and postnatal care from the use of present resources; and (3) consideration of governmental responsibility, as indicated by measures which have been adopted in this country and elsewhere, for the extension of facilities to improve the quality of care and for the education of mothers to the need for care.

PROTECTIVE LEGISLATION

Four aspects of public-health protection which have to do most directly with the protection of motherhood are considered here briefly: (1) Regulation of obstetrical practice; (2) licensing and inspection of public and private hospitals and maternity hospitals;

(3) social-hygiene legislation and the control of venereal diseases; and (4) reportability of puerperal septicemia. On account of the limitations of the present bulletin these topics can be dealt with only summarily, but references are given to sources from which details can be obtained.

Regulation of the practice of obstetrics.

The regulation of the practice of obstetrics both by physicians and by midwives takes the form of requiring a license to practice, of establishing minimum requirements for obtaining such a license, and of defining and prescribing penalties for malpractice.

Licensing of physicians.—The licensing of physicians is regulated by State laws, which vary in scope, in standards for licensing, and in methods of administration. Nevertheless, all States require by law the licensing and registration of physicians; all laws provide for a board or boards of medical examiners charged with the duty of examining applicants for licenses; and all laws provide both for revocation of licenses upon conviction for specified offenses and for penalties for practicing without a license. The diversity in the State requirements is summed up in the words of Dr. N. P. Colwell:

> At the present time, instead of one law and one board in each State to enforce its provisions [of the medical practice act] there are, in the 48 States, 96 separate and independent boards, some States having as many as five or six different boards, created by as many independent practice acts outlining as many differing standards of educational qualifications.[1]

Important points covered by the laws or in some States by the regulations of the boards are: Educational requirements preliminary to the medical course, medical education, examination for license, and reciprocity between States.

With regard to educational requirements preliminary to the medical course a great many States (38 in 1924) require the completion of at least two years of collegiate work; a few States (3 in 1924) require the completion of but one year of collegiate work; and a few (5 in 1924) require simply graduation from a standard four-year high-school course. Two States and the District of Columbia had in 1924 no requirement as to preliminary education.[2]

Most States admit to examination for a license to practice medicine only graduates from a "reputable medical college" or from a college approved by the board of medical examiners. In approving medical colleges many States accept the ratings of the Council on Medical Education and Hospitals of the American Medical Association; some States admit graduates only of "Class A" medical colleges, and others admit graduates of both "Class A" and "Class B" colleges. One State (Massachusetts) and the District of Columbia in 1924 admitted to examination graduates of any "legally chartered" medical college.[3]

All States require that applicants for licenses to practice medicine pass a written examination. This examination may be waived,

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[1] Colwell, N. P., M. D.: Medical Education, 1920–1922, pp. 14–15. U. S. Bureau of Education Bulletin, 1923, No. 18.

[2] Laws (abstract) and Board Rulings Regulating the Practice of Medicine in the United States and Elsewhere (revised to Jan. 1, 1924), pp. 234–235. American Medical Association, Chicago, 1924.

[3] Ibid., extract opposite p. 320. For summaries of the Medical Practice Acts, see pp. 13–164; definitions of classes A, B, and C, medical colleges, pp. 214–223; ratings of the medical colleges of the United States, pp. 223–228; and summaries of State laws with respect to examinations, reciprocity, etc., pp. 234–245.

however, in the majority of States (in all except 4 in 1924) in accordance with "reciprocity arrangements" by which under certain conditions a physician within a State who has been licensed in another State may be granted a license to practice without examination. The conditions upon which such licenses by reciprocity are granted, the number of States the licenses of which are recognized, and the strictness with which these arrangements are enforced vary from State to State. In some cases the State board may grant licenses upon the basis of licenses granted in other States without "reciprocal" relations.[4]

Licensing and regulation of midwives.—In the United States the licensing of midwives, as in the case of the licensing of physicians, is a matter for the individual States to regulate. A wide variety of laws is found, the principal points of which are given in Appendix E (p. 132). In general, legislation regarding the midwife, except in a few States, is in an extremely backward condition. In some States this results from the fact that there are relatively few midwives; in other States it is due in part to the association of the problem with the growth in number of the foreign-born population groups in which the midwife is preferred by custom to the physician, and in part to the reluctance on the part of the medical profession and the health authorities to recognize the lowering of the standards that the increased employment of midwives seems to imply; and in still other States, which have a considerable proportion of colored population, the condition is associated with special difficulty in providing adequate trained personnel.

In one State (Massachusetts) midwives are not recognized by law, though special investigations have shown that many of them were practicing.[5] In the majority of States (37 in 1924) a midwife is required to register, usually with the local health officer, but in only a few States (18 in 1924) is a license a prerequisite to such registration. In the States in which midwives must be licensed the license is issued only after examination;[6] but in few such States (10 in 1924) are there any educational qualifications, and these qualifications vary from State to State. Because of the fact that there are few satisfactory schools of midwifery in this country,[7] relatively few midwives have adequate educational training. Among those that serve foreign-born groups, however, many have had training in good foreign schools of midwifery. Midwives in the Southern States, especially the negroes, are for the most part untrained.

Appendix E gives also the principal regulations in effect governing the practice of midwives. In general, these regulations prescribe that the midwife shall restrict her practice to normal cases and to normal procedures; she is prohibited from performing operations and from using instruments or drugs, and in all abnormal cases she is required to call in a physician.

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[4] For details of these reciprocal arrangements see Laws (abstract) and Board Rulings, pp. 236–237. See also discussion by N. P. Colwell, M. D.: "Legislation regulating the practice of medicine, preliminary and medical education," in The Monthly Bulletin of Medical Education, p. 10. (Reprinted from the Monthly Bulletin of the Federation of State Medical Boards, September, 1915, pp. 129–136.)

[5] Huntington, J. L., M. D.: "Midwives in Massachusetts." Boston Medical and Surgical Journal, Vol. CLXVII, No. 16, pp. 542–548.

[6] Except Alabama and Rhode Island; Minnesota accepts a diploma from a school of midwifery in lieu of an examination.

[7] An inquiry addressed by the U. S. Children's Bureau in 1921 to the directors of child-hygiene divisions in the several States elicited information regarding the existence of only two such schools.

Licensing and inspecting of hospitals.[8]

Regulation of public and private hospitals and maternity hospitals in the United States includes legal provisions governing the establishment of such institutions and requiring that they be licensed and subject to inspection.

Public hospitals may be Federal, State, or local in character; in most States a local government body must obtain specific authority from the legislature to establish a hospital, but in some States general legislation requires counties or cities of a certain size to maintain hospitals. In 1925 in 39 States municipalities had specific authority to establish hospitals, although in some of these States such authority is subject to certain restrictions and limitations.[9]

Private hospitals may be operated either for profit or for charitable purposes, and may be either incorporated or unincorporated institutions. Some States require all such hospitals to be licensed; in some States the power to require licensing is delegated to municipalities; in others the law contains no provisions on this subject.[10]

The licensing of maternity hospitals is a comparatively recent development. In 1925 in 29 States licenses were required for such hospitals. With the power of licensing is usually associated the power of inspecting, and the power to revoke the license for cause.[11]

Social-hygiene legislation.

Since venereal diseases are serious complications in pregnancy and confinement, legislation for the control of these diseases is of great importance in public-health protection of maternity. Such legislation takes two forms.[12] In the first place, a number of States have enacted laws, which are for the most part of recent origin, requiring a certificate of physical fitness or of freedom from venereal disease as a prerequisite for obtaining a marriage license. Such laws have been enacted (1925) in eight States,[13] but are not always well enforced. In the second place, practically all the States have made venereal diseases reportable by physicians with certain safeguards, such as secret returns on reports by number instead of by name. This is secured as a rule by regulations promulgated by the State board of health, but in some States special laws have been enacted to deal with this public-health problem.

Except for the laws of two States all this legislation was enacted during or following the Great War, and to a large extent as a result of the stimulation to State activity given by the Federal grants under the provisions of the Chamberlain-Kahn Act of 1918. The annual reports of the United States Public Health Service from 1918 to 1923 contain a full description of the campaign undertaken to combat venereal disease.

In order to obtain the grants from the Federal funds, according to the regulations adopted by the Interdepartmental Social Hygiene Board, a State must satisfy the following conditions: Either by law

[8] The information upon which this section is based is contained in an article entitled "Legislation affecting hospitals," by Dorothy Ketcham, in the Modern Hospital Year Book (5th Edition), pp. 25–44 (Chicago, 1925).

[9] Ibid., pp. 31–32.

[10] Ibid., pp. 32–37.

[11] Ibid,. p. 37.

[12] See Social Hygiene Legislative Manual, 1921, published by the American Social Hygiene Association, New York; also Digests of Social Hygiene Laws of all States in the United States in 1922, New York.

[13] Alabama, Louisiana, Minnesota, North Carolina, North Dakota, Oregon, Wisconsin, and Wyoming. See also "The 'eugenic' marriage laws of Wisconsin, Michigan, and Illinois," by Bernard C. Robert, in Social Hygiene, Vol. VI, No. 2 (April, 1920), pp. 227–254.

or by regulations having the force of law it must provide that venereal disease be reportable to local health authorities, and there must be penalties for physicians and others in case of failure to report; cases of diseases must be investigated to discover the source of infection; the spread of venereal disease must be declared unlawful; there must be provision for the control of infected persons who will not cooperate in preventing the spread of infection; the travel of infected persons must be restricted, and patients must be given pamphlets of instructions.

At the close of the fiscal year 1919, the first year in which the Chamberlain-Kahn Act operated, 46 States had qualified to obtain the Federal grant of money, and hence had laws or regulations that satisfied these minimum requirements; by 1922 all the States had qualified for their quotas of the Federal appropriation, but the District of Columbia had not.[14]

Reportability of puerperal septicemia.[15]

For the prevention of puerperal septicemia the importance of making it a reportable disease is clear, since the health authorities are able to enforce necessary precautions only if they have prompt information that cases have occurred. In the United States in 1923 the laws or regulations of 16 States included puerperal septicemia among reportable diseases (Table 50). But in only one of the States within the death-registration area (Mississippi) did the number of cases reported to the State health officer exceed the number of deaths.[16]

TABLE 50.—*States in which puerperal septicemia is a reportable disease and the year in which it was made reportable* [1]

State	Year when made reportable	State	Year when made reportable
Colorado	1916	Ohio	[3]
Delaware	[2]	Oklahoma	1920
Illinois	1916	Oregon	1918
Kentucky	[3]	Pennsylvania	1906
Mississippi	1917	South Dakota	1912
Nevada	1911	Vermont	1908
New Mexico	1919	Washington	1921
New York	1914	Wyoming	[3]

[1] Compiled from replies to questionnaires relative to reportability of puerperal septicemia sent by the Children's Bureau in 1923 to State boards of health.
[2] Before 1918.
[3] Year not stated.

PROVISIONS FOR MATERNITY CARE

Personnel.

The number of physicians legally qualified to practice in the United States in 1925 was 147,010,[17] or 13 per 10,000 population. In Table 51 are given the number and proportion to population of legally qualified physicians in each of the States. In view, however,

[14] Annual Reports of the Surgeon General of the U. S. Public Health Service, for the fiscal years 1918, 1919, 1920, 1921, 1922, 1923.
[15] The information upon which this section is based was obtained by correspondence from the State boards of health. Returns were not received from Georgia, North Carolina, and South Carolina.
[16] Returns for Mississippi in 1920 gave 736 cases and 165 deaths. For Nevada, outside the death-registration area, returns for 1912 gave 15 cases and 6 deaths. In a number of States, however, no figures as to the number of cases reported were obtained.
[17] American Medical Directory, 1925, p. 8. American Medical Association, Chicago.

of the wide differences in the requirements set up by different States for licenses to practice medicine these figures do not have so great significance as they would have if the standards for admission to the profession were all equally high.[18] Furthermore, for the present purpose it would be desirable to have figures showing actual, rather than minimum, qualifications,[19] and even more desirable to know the number and the qualifications of those physicians who take confinement cases. But no figures are available on these points.[20]

TABLE 51.—*Proportion of physicians to population, by States, 1925*

State	Physicians (1925)		State	Physicians (1925)	
	Number [1]	Per 10,000 estimated population		Number [1]	Per 10,000 estimated population
United States	147,010	13.0	Montana	525	8.1
			Nebraska	1,869	13.8
Alabama	2,284	9.3	Nevada	129	16.7
Arizona	378	9.3	New Hampshire	601	13.4
Arkansas	2,212	11.9	New Jersey	3,567	10.2
California	8,363	20.8	New Mexico	365	9.6
Colorado	1,837	18.0	New York	17,671	15.9
Connecticut	1,884	12.3	North Carolina	2,281	8.3
Delaware	256	10.9	North Dakota	485	7.1
District of Columbia	1,813	36.4	Ohio	8,113	12.8
Florida	1,452	11.6	Oklahoma	2,524	11.3
Georgia	3,122	10.2	Oregon	1,176	13.9
Idaho	416	8.5	Pennsylvania	11,140	12.0
Illinois	10,743	15.4	Rhode Island	771	11.5
Indiana	4,251	13.9	South Carolina	1,317	7.4
Iowa	3,378	13.5	South Dakota	604	9.1
Kansas	2,364	13.0	Tennessee	3,128	12.9
Kentucky	3,041	12.2	Texas	6,063	11.9
Louisiana	1,991	10.6	Utah	505	10.3
Maine	1,037	13.3	Vermont	537	15.2
Maryland	2,313	15.0	Virginia	2,534	10.3
Massachusetts	6,187	15.0	Washington	1,781	12.0
Michigan	4,837	11.6	West Virginia	1,753	10.9
Minnesota	2,823	11.0	Wisconsin	2,826	10.1
Mississippi	1,702	9.5	Wyoming	255	11.5
Missouri	5,806	16.7			

[1] As given in American Medical Directory, 1925, 9th Edition, p. 8. American Medical Association, Chicago.

Table 52 indicates that the number of physicians per 10,000 population in cities of 5,000 and over (18.4) is about twice as high as that in more sparsely settled areas (9.7). These figures indicate that the cities are better provided with medical services than are the rural districts; if figures were available showing the distribution of obstetrical specialists they would undoubtedly show that the cities, especially the larger cities, are even more favored as contrasted with the smaller cities and the rural districts.

[18] For the legal minimum qualifications of physicians in the different States see Laws (abstract) and Board Rulings Regulating the Practice of Medicine in the United States and Elsewhere (revised to Jan. 1, 1924).

[19] Of interest in this connection is the discussion of medical education by N. P. Colwell, M. D., in Medical Education 1920–1922 (U. S. Bureau of Education Bulletin, 1923, No. 18). See also Laws and Board Rulings, pp. 223–228.

[20] Williams, J. Whitridge, M. D.: "Has the American Gynecological Society done its part in the advancement of obstetrical knowledge?" Journal of the American Medical Association, June 6, 1914, Vol. LXII, pp. 1767–1771.

TABLE 52.—*Proportion of physicians to population for urban and rural areas, 1920* [1]

Population	Number of cities	Total population	Per cent population	Number of physicians [2]	Ratio of physicians to population	Physicians per 10,000 population [3]	Percentage all physicians
United States		105,710,620	100.0	145,608	726	13.8	100
Cities of 5,000 and over	1,467	49,710,650	47.0	91,565		18.4	
500,000 and above	12	16,369,301	15.5	30,932	529	18.9	21
200,000 to 500,000	21	6,353,529	6.0	12,862	494	20.2	9
50,000 to 200,000	111	9,972,243	9.4	17,254	578	17.3	12
10,000 to 50,000	602	12,017,783	11.4	21,204	566	17.6	15
5,000 to 10,000	721	4,997,794	4.7	9,313	537	18.6	6
Below 5,000		55,999,970	53.0	54,043	1,036	9.7	37

[1] Compiled from Medical Education, 1920–1922, by N. P. Colwell, p. 12 (U. S. Bureau of Education, Bulletin, 1923, No. 18) and Fourteenth Census of the United States, 1920, Vol. 1, Population, Tables 31 and 38, pp. 50, 58 (U. S. Bureau of the Census).
[2] From the American Medical Directory for 1921.
[3] The number of physicians is compared with the population on Jan. 1, 1920, as enumerated by the census

The number of nurses in the United States in 1920, according to the census, was about 300,000, including both male and female. Approximately half of these (149,128) were reported as trained and registered nurses, of whom perhaps 11,000 were engaged in public-health nursing, about the same number in hospitals and other institutions, and the rest (over 120,000) in private duty. In addition to the trained and registered nurses there were 151,996 attendants, practical nurses, and others below the grade of registered nurse, and 54,953 student nurses in hospitals. In 1920, therefore, it was estimated that there was one registered nurse to every 700 persons, and one nurse (trained or untrained) to every 294 persons in the United States.[21] As in the case of physicians these figures represent, of course, the total nursing personnel available for all purposes and not nurses engaged in obstetrical work.[22]

The number of midwives engaged in practice in the several States in 1923, compiled from the scanty evidence available, is shown in Table 53. In the United States as a whole, according to figures furnished the Children's Bureau by State boards of health or State bureaus of child hygiene, at least 26,633 midwives in 31 States were registered or licensed to practice. But even in States which require a license or registration or both, in addition to authorized midwives, a larger or smaller number were reported as practicing without the required license. In nine States, which did not require licenses or registration, estimates were furnished by the State health officials of the number engaged in practice. For a few States no estimates could be furnished, and the numbers in the table are merely those given in the census of occupations; these figures are undoubtedly a minimum, for in practically every State the number of midwives reported as authorized to practice by State health officials exceeded the number enumerated by the census.[23] As already noted (see p. 76) except in the

[21] Nursing and Nursing Education in the United States; report of the Committee for Study of Nursing Education, p. 171. New York, 1923.
[22] For a discussion of nursing education see Nursing and Nursing Education in the United States, also Statistics of Nurse Training Schools, 1919–20. U. S. Bureau of Education Bulletin, No. 51. 1921.
[23] The total number of midwives enumerated in the census of 1920 for the entire United States was 4,773. Fourteenth Census of the United States, Vol. IV, Population, p. 43.

States which exercise strict supervision probably comparatively few of these midwives were adequately trained.[24]

TABLE 53.—*Midwives authorized to practice and percentage of births attended by midwives, by States, 1923* [1]

State	Midwives		
	Authorized to practice	Others estimated	Percentage of births attended
Total	26,633	18,045	(2)
Alabama	1,862	(2)	32
Arizona	45	(2)	12
Arkansas	[3] 181	(2)	17
California	104	(2)	8
Colorado	15	25	(2)
Connecticut	123	(2)	16
Delaware	200	(2)	16
District of Columbia	33	(2)	4
Florida	(2)	2,000	38
Georgia	1,800	(2)	(2)
Idaho	100	(2)	(2)
Illinois	1,115	(2)	(2)
Indiana	[4] 254	(2)	5
Iowa	40	(2)	0.1
Kansas	(2)	[5] 8	(2)
Kentucky	2,500	(2)	18
Louisiana	230	1,808	47
Maine	(6)	65	(2)
Maryland	339	346	22
Massachusetts	(6)	[7] 117	(2)
Michigan	(6)	1,162	7
Minnesota	118	48	(2)
Mississippi	3,218	991	48
Missouri	[8] 803	(2)	(2)
Montana	334	(2)	3
Nebraska	(6)	20	2
Nevada	(2)	(2)	(2)
New Hampshire	7	None.	(2)
New Jersey	415	262	27
New Mexico	(6)	[5] 5	(2)
New York	1,976	(2)	[9] 11
North Carolina	2,500	4,000	35
North Dakota	(2)	[3] 2	(2)
Ohio	(2)	[5] 152	(2)
Oklahoma	None.	[5] 16	(2)
Oregon	16	(2)	(2)
Pennsylvania	(2)	1,500	(2)
Rhode Island	47	(2)	(2)
South Carolina	996	3,715	(2)
South Dakota	(6)	133	3
Tennessee	815	1,000	12
Texas	(6)	300	(2)
Utah	(2)	350	(2)
Vermont	(6)	[5] 1	(2)
Virginia	6,036	(2)	35
Washington	50	(2)	4
West Virginia	(6)	[5] 19	(2)
Wisconsin	361	(2)	10
Wyoming	(2)	(2)	(2)

[1] Except where otherwise noted, data were obtained by correspondence with State boards of health or bureaus of child hygiene. The totals give the sum of the figures so far as information is available.
[2] Not available.
[3] Figures for six counties only.
[4] Number licensed since 1897.
[5] Fourteenth Census of the United States, Vol. IV, Population, Table 15.
[6] State does not license nor register midwives.
[7] In a surveyed district only.
[8] Number registered since 1887.
[9] Percentage based on figures for New York State exclusive of New York City.
[24] A study of 115 midwives in Minnesota who were interviewed by representatives of the State division of child hygiene showed only 3 in grade A ("women who were * * * alert and intelligent, who gave evidence of understanding the proper technique of a normal delivery, the recognition of obstetrical complications, and particularly an understanding of their limitations * * * a high degree of neatness, cleanliness and orderliness") and only 5 in grade B (those who failed in one or two respects from qualifying or belonging to grade A). Boynton, Ruth E., M. D.: "The midwife survey in Minnesota." Child Health Magazine, Vol. V (Apr. 5, 1924), p. 164. For a discussion of the whole subject see Anna E. Rude, M. D., "The midwife problem in the United States," Paper read before the section on Obstetrics, Gynecology, and Abdominal Surgery at the 75th Annual Session of the American Medical Association, San Francisco, June, 1923.

Facilities.

Information is not available for the whole United States on the number of agencies giving prenatal care. An inquiry made by the Children's Bureau in 1920 showed that there were at least 558 agencies which gave prenatal care to mothers either exclusively or in connection with other health activities, and which served States, counties, or urban areas of 10,000 or more inhabitants.[25] This figure is an understatement of the total number of such agencies, since the inquiry was limited to cities of at least 10,000 population and since even in these cities agencies may have been omitted because of inadvertent omissions from the list of those to which questionnaires were sent, failure to reply to the questionnaire, or for other reasons.

The number of public and private hospitals in the United States in 1924, according to the Modern Hospital Year Book, was 6,762, including 180 exclusively maternity hospitals.[26] Unfortunately, no comprehensive statistics are available to show the number of beds available for confinement care in these institutions.[27]

Information as to the number of maternity homes in which expectant mothers are cared for both before and after childbirth as well as during confinement, as distinguished from maternity hospitals in which women are received for confinement only, is available for only a comparatively few States. In Minnesota 11 and in Pennsylvania 24 maternity homes were found and visited in the course of a survey made by the Children's Bureau in 1923.[28]

Inadequacy of care received.

To serve as a rough basis for judging the types and amount of skilled care and supervision now actually received by mothers in the United States, the minimum standards for public protection of the health of mothers adopted by the Washington and regional conferences on child welfare in 1919 [29] are given below:

1. Maternity or prenatal centers, sufficient to provide for all cases not receiving prenatal supervision from private physicians. The work of such a center should include:

(*a*) Complete physical examination by physician as early in pregnancy as possible, including pelvic measurements, examination of heart, lungs, abdomen, and urine, and the taking of blood pressure; internal examination before seventh month in primipara; examination of urine every four weeks during early months, at least every two weeks after sixth month, and more frequently if indicated; Wassermann test whenever possible, especially when indicated by symptoms.

(*b*) Instruction in hygiene of maternity and supervision throughout pregnancy, through at least monthly visits to a maternity center until end of sixth month, and every two weeks thereafter. Literature to be given mother to acquaint her with the principles of infant hygiene.

(*c*) Employment of sufficient number of public-health nurses to do home visiting and to give instructions to expectant mothers in hygiene of pregnancy and early infancy; to make visits and to care for patient in puerperium; and to see that every infant is referred to a children's health center.

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[25] Compiled from list given on pp. 321–340, Directory of Local Child-Health Agencies in the United States (U. S. Children's Bureau Publication No. 108, Washington, 1922).

[26] The Modern Hospital Year Book (Fifth edition), p. 16. Chicago, 1925. Of the 6,762 hospitals, 1,604 were public and 5,158 were private; 4,725 were general hospitals and of these the majority were doubtless open to maternity cases.

[27] Figures from 2,645 hospitals which admitted maternity cases in 1920 (including 97 exclusively maternity hospitals) showed at least 27,405 beds available for maternity cases. See Anna E. Rude, M. D.: "The Sheppard-Towner Act in relation to public health," p. 11 (Paper read before the section on preventive and industrial medicine and public health at the Seventy-third Annual Session of the American Medical Association, St. Louis, May, 1922).

[28] See A Study of Maternity Homes in Minnesota and Pennsylvania (U. S. Children's Bureau Publication; in press).

[29] Minimum Standards for Child Welfare, Adopted by the Washington and Regional Conferences on Child Welfare, pp 7–8. U. S. Children's Bureau Publication No. 62. Washington, 1920.

(*d*) Confinement at home by a physician or a properly trained and qualified attendant, or in a hospital.

(*e*) Nursing service at home at the time of confinement and during the lying-in period, or hospital care.

(*f*) Daily visits for five days, and at least two other visits during second week by physician or nurse from maternity center.

(*g*) At least ten days' rest in bed after a normal delivery, with sufficient household service for four to six weeks to allow mother to recuperate.

(*h*) Examination by physician six weeks after delivery before discharging patient.

Where these centers have not yet been established, or where their immediate establishment is impracticable, as many as possible of these provisions here enumerated should be carried out by the community nurse, under the direction of the health officer or local physician.

2. Clinics, such as dental clinics and venereal clinics for needed treatment during pregnancy.

3. Maternity hospitals, or maternity wards in general hospitals, sufficient to provide care in all complicated cases and for all women wishing hospital care; free or part-payment obstetrical care to be provided in every necessitous case at home or in a hospital.

4. All midwives to be required by law to show adequate training, and to be licensed and supervised.

5. Adequate income to allow the mother to remain in the home through the nursing period.

6. Education of general public as to problems presented by maternal and infant mortality and their solution.

Prenatal care.—Evidence relating to the amount or quality of prenatal care afforded mothers in the United States is relatively meager. In special studies made by the Children's Bureau such evidence has been obtained for a few cities and rural districts, which in the absence of comprehensive statistics may serve as an indication of the prevalence of prenatal care in typical communities.

In Baltimore, Md., a city which has an excellent medical school and hospital and well-developed clinics but in which a comparatively small proportion of the births occur in hospitals (see p. 86), a study was made of the prenatal care received by all mothers of legitimate infants born in 1915.[30] Among mothers who had had some prenatal care were included all who either had had a urinalysis or had made one or more visits to a physician during pregnancy. A visit merely to engage the services of a physician without medical consultation was not considered a visit for this tabulation.

Nearly half the mothers studied (47.5 per cent) had had no medical prenatal care of any kind. On the other hand over half (52.5 per cent) had received medical care—12.6 per cent from physicians attached to the clinics and 39.8 per cent from private physicians.

The proportion of mothers in the different nationality groups who had received prenatal care varied from 13.9 per cent of the Polish and 22.1 per cent of the Italian, to 53.4 per cent of the Jewish, 57 per cent of the colored, and 58.3 per cent of the native white. Of the mothers whose husbands earned from $550 to $649, only 40.1 per cent had received prenatal care, whereas of those whose husbands had died or had earned nothing during the year following the birth of the baby, 57.3 per cent had received such care. But in the group whose husbands earned $2,850 and over the proportion receiving prenatal care was 89.2 per cent. These variations were evidently influenced in part by prejudice against receiving such care,

[30] Infant Mortality; results of a field study in Baltimore, Md., based on births in one year, by Anna Rochester, Appendix VI, pp. 203-217.

as in case of the low proportions of Polish and Italian mothers, in part by provisions for free care by clinics and by proximity to them, as in case of the comparatively high proportion of colored mothers, and in part by the funds available to pay for medical prenatal care.

The care received was classified roughly into three grades, designated by the letters A, B, and C. In grade C were placed all cases in which the mother either had had one urinalysis or had made one or more visits to a physician during pregnancy but in which the care could not qualify as either grade A or grade B. "To qualify in grade B the care received by the mother must have satisfied all four of the following requirements: (1) Some supervision by a physician; (2) at least one urinalysis; (3) at least an abdominal examination; (4) pelvic measurements if a primipara. To qualify in grade A, the care must have fulfilled the following additional requirements: Monthly visits to clinic from the fifth to the ninth month, or under supervision of private physician from the fifth to the ninth month, and monthly urinalysis during the same period."

Of the entire group of married mothers, only 5.1 per cent had prenatal care which could be classified as of grade A; 17.1 per cent had grade B care; 25.6 per cent had grade C care; and 4.5 per cent had care the grade of which could not be definitely determined. For 48 per cent of the mothers who had received prenatal care this care did not begin until after the fifth month and consequently could not satisfy the requirements for grade A. More than one-fourth of the mothers who were classified as having had prenatal care saw a physician only once during pregnancy. Only 31.4 per cent had had as many as five consultations.

The following is quoted from the publication based on the Baltimore study:

> Several points may be mentioned in connection with these results. In the first place the requirements even for grade A are low and may by no means be considered ideal. The fact that so small a proportion of mothers received care of grade A with its low standard is therefore all the more significant. In the second place, though the care given by the three clinics was based upon their records, the classification of care given by the private physicians was based upon the mothers' statements. The results are, therefore, subject to qualification in that the mothers' memories may have been at fault or that the mothers may not have understood the object or scope of the examination made by the physicians. On the other hand, the agents were given careful instructions in regard to the questions to be asked and in every case the answers were so classified as to overstate rather than to understate the extent of care actually received. In the third place, it should be emphasized that the results of this study can not be interpreted as in any way a criticism of the physicians or the clinics, since the small proportion of cases receiving the best grade of care is largely determined by the fact that the mothers did not present themselves for treatment early enough in their pregnancies, or did not continue visits with sufficient regularity. For a better showing the fuller cooperation of the mothers is required, and this can be secured only after the importance of early care is generally recognized and appreciated.[31]

In Gary, Ind., a city with relatively undeveloped clinical facilities, a similar study was made relating to prenatal care received by mothers of infants born in 1916. The result of the study showed that 70.2 per cent of the mothers had not received any medical prenatal care. Only 2.4 per cent had received care of grade A, 3.9 per

[31] Ibid., pp. 208–209.

cent had received care of grade B, and 23.1 per cent had received care of grade C.[32]

Studies made in rural districts have shown on the whole even smaller proportions of mothers who had received prenatal care. In one rural district in northern Wisconsin, in only one-eighth of the recorded pregnancies during the period covered by the survey did the mother have any medical prenatal care, and in only one-fifth of the cases in which a physician attended the birth did he give any prenatal supervision. In a rural district in the southern part of the same State, however, the proportion receiving supervision was much larger; of the mothers attended at confinement by physicians, nearly two-fifths (38 per cent) had received supervision during pregnancy. In a rural county in Kansas one-third of the mothers of infants born in a two-year period had received some prenatal care from physicians; but less than 1 per cent had care that could have been considered as of grade A. In a homesteading county in Montana, on the other hand, a proportion of less than 1 in 4 of all the mothers visited had consulted a physician during pregnancy, and in no case was the care received such as to satisfy the requirements for grade A. In communities studied in the Southern States the situation with regard to prenatal supervision was found to be very similar to that found in the rural districts of the Northern and Western States. In a rural county in North Carolina only 21 of 79 white mothers, or less than one-third, saw a physician during pregnancy, and only 12 had urinalysis. Of the 86 negro mothers, 2 saw a physician before confinement, and 1 reported urinalysis. In all, therefore, only 21.8 per cent of the cases had any prenatal care. None of these mothers could be regarded as having had care of grade A. In another county in a mountainous district of North Carolina only 5 per cent of the mothers visited had any medical prenatal care, and again in no case could the care received be classified as of grade A. In selected rural areas of Mississippi only about 16 per cent and in a mountain county in Georgia only 14 per cent of the mothers had received any medical prenatal care.[33]

The surveys referred to, made by agents of the Children's Bureau, relate to a period from four to eight years ago, and the relatively small proportions of mothers shown by them who had received prenatal care have probably been increased since that time as a result in part at least of the campaigns of popular education on this subject (see pp. 95–97) and of the establishment and development of prenatal clinics. The development of prenatal care and nursing services to mothers by some of the larger life-insurance companies has been another important factor in securing better care of mothers during pregnancy.[34] The establishment of prenatal clinics in many cities, usually in connection with but in some cases entirely separate from the infant-welfare centers, has made available to many mothers skilled care and advice. But even yet, in spite of these encouraging

[32] Infant Mortality; results of a field study in Gary, Ind., based on births in one year, by Elizabeth Hughes, p. 28–29. U. S. Children's Bureau Publication No. 112. Washington, 1922.

[33] Maternity and Infant Care in Two Rural Counties in Wisconsin, by Florence Sherbon, M. D., and Elizabeth Moore, pp. 37–38, 64; Maternity and Infant Care in a Rural County in Kansas, by Elizabeth Moore, p. 28; Maternity Care and the Welfare of Young Children in a Homesteading County in Montana, by Viola I. Paradise, p. 37; Rural Children in Selected Counties of North Carolina, by Frances Sage Bradley, M. D., and Margaretta A. Williamson, p. 30; Maternity and Child Care in Selected Rural Areas of Mississippi, by Helen M. Dart, p. 24; Maternity and Infant Care in a Mountain County in Georgia, by Glenn Steele, p. 11. U. S. Children's Bureau Publications Nos. 26, 33, 34, 46, 88, and 120.

[34] See Nursing and Nursing Education in the United States, p. 49.

developments, probably but a small proportion of mothers receive anything like adequate care during the prenatal period.[35]

Confinement and postnatal care.—With regard to confinement care evidence is available, though only for certain areas, on two points—the proportion of births that occurred in hospitals and the proportion of births that were attended by physicians.

The proportion of births in hospitals in 1921 in cities from which the Children's Bureau was able to secure information on this point is shown in Table 54. The figures varied from 85 per cent in San Francisco and 62.1 per cent in Minneapolis to 18.7 per cent in Baltimore (in 1920) and 9.2 per cent in New Bedford.

The proportion of hospital confinements is much larger in cities than in rural districts. The better hospital facilities not only would attract mothers living in the cities but would induce many mothers living in neighboring districts to come to the city hospitals for confinement. The effect of such a tendency for mothers from the country and from small towns to seek the special facilities of the cities would be to increase the number of births in the city hospitals and thus to increase the proportion of hospital births in cities. The contrast between the proportions of hospital births in city and country districts can be shown in figures for Maryland; of the births in Baltimore, 18.7 per cent occurred in hospitals, as compared with only 2.6 per cent of the births in Maryland outside Baltimore.

TABLE 54.—*Proportion of births in hospitals in certain cities* [1]

City	Year	Per cent of births in hospitals	City	Year	Per cent of births in hospitals
San Francisco, Calif	1921	85.0	Yonkers, N. Y	1921	30.4
Minneapolis, Minn	1921	62.1	Pittsburgh, Pa	1921	27.4
St. Paul, Minn	1921	60.4	Cleveland, Ohio	1921	26.7
Spokane, Wash	1921	60.0	Grand Rapids, Mich	1921	26.2
Hartford, Conn	1921	53.0	Buffalo, N. Y	1921	26.1
District of Columbia	1921	52.9	Wilmington, Del	1921	24.7
Springfield, Mass	1921	50.1	Scranton, Pa	1921	24.0
Syracuse, N. Y	1921	48.3	Indianapolis, Ind	1921	22.1
Albany, N. Y	1921	47.3	Toledo, Ohio	1921	21.9
Oakland, Calif	1921	45.8	Trenton, N. J	1921	20.1
Duluth, Minn	1921	38.7	New Orleans, La	[2] 1922	19.0
Cincinnati, Ohio	May, 1922	36.7	Baltimore, Md	1920	18.7
Salt Lake City, Utah	1921	36.7	Louisville, Ky	1921	18.1
Cambridge, Mass	1921	36.3	Akron, Ohio	1921	18.0
Columbus, Ohio	May, 1922	33.6	Lowell, Mass	1921	17.7
Philadelphia, Pa	1921	31.2	Fall River, Mass	1921	16.1
Bridgeport, Conn	1921	30.9	Milwaukee, Wis	1921	9.8
Newark, N. J	1921	30.6	New Bedford, Mass	1921	9.2

[1] Based upon reports of State or city bureaus of vital statistics.
[2] First six months.

Though the best type of care can be obtained in well-regulated hospitals, confinement in a hospital does not necessarily insure such care. Information concerning the proportion of births in hospitals,

[35] In a study of the health work in 1920 in the 83 largest cities of the United States prenatal clinics were found in 68 cities, and in 5 of the 15 which apparently had no such clinics visiting nurses provided care and advice to expectant mothers. "Of 35 cities giving definite figures, 6 report that less than one mother per 100 infants born (including stillbirths) attended a prenatal clinic during year; 17 cities report from 1 to 5 mothers in attendance; 9 from 5 to 10; and 3 over 10 (Indianapolis 11.9, Cleveland 12.2, and Boston 20.2)." Infant Hygiene, Report of the Committee on Municipal Health Department Practice of the American Public Health Association in cooperation with the United States Public Health Service, by Ira V. Hiscock, pp. 115–116. Public Health Service Bulletin No. 136. Washington, 1923.

therefore, without further evidence as to the management and the routine precautions taken in these hospitals, can not be considered completely satisfactory evidence as to the quality of confinement care. Such evidence, unfortunately, is not available.

On the other hand, in certain respects hospital care is distinctly superior to that received by many mothers who are confined at home. Hospital care implies that the mother receives medical attention, that she has the services of a nurse and whatever additional attendance is required, and that, in case her condition requires it, she can be operated upon with a minimum of risk. Furthermore, while in a hospital a mother has complete rest from housework and from other employment.

For a few cities evidence is available which shows that the proportion of births in hospitals is increasing. For example, in Milwaukee, Minneapolis, and St. Paul, the proportion of hospital births (see Table 55) increased rapidly during the last decade. Unfortunately comprehensive statistics on this question are not available.

TABLE 55.—*Increase in proportion of deliveries in hospitals; Minneapolis and St. Paul, Minn., and Milwaukee, Wis., 1913–1922* [1]

Year	Births (including stillbirths)								
	Minneapolis			St. Paul			Milwaukee		
	Total	In hospitals		Total	In hospitals		Total	In hospitals	
		Number	Per cent		Number	Per cent		Number	Per cent
1913	7,407	1,514	21	4,964	1,280	26	11,270	568	5.0
1914	8,220	2,084	26	5,152	1,506	29	11,929	707	5.9
1915	8,842	2,629	30	5,469	1,768	32	11,278	819	7.3
1916	9,163	3,307	37	5,461	2,068	38	11,369	987	8.6
1917	8,986	3,717	41	5,352	2,219	42	11,555	1,320	11.4
1918	9,028	4,442	49	5,351	2,164	40	11,697	1,666	14.2
1919	8,457	4,365	52	5,013	2,618	52	10,844	1,778	16.4
1920	9,200	5,535	60	5,355	2,989	56	11,219	2,407	21.5
1921	9,436	5,859	62	5,812	3,506	60	11,179	2,493	22.3
1922	9,543	6,175	65	5,907	3,846	65	10,563	2,709	25.6

[1] Figures for Minneapolis and St. Paul from "Results gained in maternity cases in which antenatal care has been given," by Fred L. Adair, M. D., and C. O. Maland, M. D., p. 11; figures for Milwaukee from Child Welfare Statistics, by Ira F. Thompson, M. D., p. 11 (mimeographed report furnished by courtesy of Doctor Thompson, Deputy Commissioner of Health of Milwaukee).

The proportions of births attended by physicians and midwives are shown in Table 56 for the States, and in Table 57 for the cities of over 100,000 population from which the Children's Bureau received information on this point. The proportions attended by physicians were highest in those States and cities where the proportions of foreign born and of colored were low. Births to native white mothers were practically all attended by physicians where they were available. Among the foreign born and the colored, however (especially the latter), midwives frequently attended births (see p. 76). In the Southern States a considerable proportion even of the births to native white mothers were attended by midwives.

TABLE 56.—*Proportion of births attended by physicians, midwives, and others*[1]

State	Year	Per cent of registered births attended by—			
		Physicians	Midwives and others	Midwives	Others
In birth-registration area:					
Connecticut	1921			16.1	
New York State (exclusive of New York City)	1918	84.1	15.9	15.1	0.8
New Jersey	1921			26.7	
Indiana	1921	95.3	4.7	4.4	.3
Wisconsin	1919	87.4	12.6	9.7	3.0
Nebraska	1921	97.0	3.0	2.1	.9
Maryland	1920	77.4	22.6	22.2	.4
White	1920	81.8	18.2	17.9	.3
Colored	1920	58.5	41.5	40.8	.7
District of Columbia	1921	95.6	4.4	4.4	
Virginia	1921	64.6	35.4	33.3	2.0
North Carolina	1921	64.9	35.1		
White	1921	82.2	17.8		
Colored	1921	26.5	73.5		
Kentucky	1920	82	18		
Montana [2]	1920	93.5	6.5	3.4	3.1
Washington	1921	95.0	5.0	3.9	1.2
White	1921	98.6	1.4	.8	.6
Japanese	1921	26.3	73.7	66.0	7.7
Indian	1921	56.5	43.5	9.5	34.0
Other colored	1921	85.1	14.9	10.3	4.6
Outside birth-registration area:					
Florida [3]	1921	58.8	41.2	38.4	2.8
Tennessee	1921	87.7	12.3	12.0	.3
Alabama	1915	59.1	40.9	32.3	8.6
Arkansas	1921	81.7	18.3	16.6	1.7
Louisiana (exclusive of New Orleans)	1920	50.7	49.3		
White	1920	71.2	28.8		
Colored	1920	17.8	82.2		

[1] Statistics furnished by State boards of health. When leaders are inserted no information was received.
[2] Admitted to birth-registration area in 1922.
[3] Admitted to birth-registration area in 1924.

TABLE 57.—*Percentage of births attended by physicians and midwives in cities of 100,000 population and over; United States birth-registration area*[1]

City	Year	Per cent of births attended by—		
		Physicians	Midwives	Others, no attendant, or not reported
Albany, N. Y.	1922	88.0	12.0	
Baltimore, Md.	1920	74.0	25.9	0.1
Bridgeport, Conn.	1922	66.7	33.0	.3
Buffalo, N. Y.	1922	78.1	21.7	.3
Cambridge, Mass.	1922	97.7	2.2	.1
Camden, N. J.	1922	66.6	33.0	.4
Cincinnati, Ohio	1922	About 80	(2)	(2)
Cleveland, Ohio	1922	77.9	22.0	.1
Columbus, Ohio	1922	98.6	1.4	
Dayton, Ohio	1922	97.3	2.7	
Detroit, Mich.	1918	79.2	17.9	2.9
Grand Rapids, Mich.	1922	96.1	3.8	.2
Hartford, Conn.	1922	87.8	11.9	.3
Indianapolis, Ind.	1922	99.8	.1	.1
Jersey City, N. J.	1921	(2)	38.0	(2)
Louisville, Ky.	1922	97.6	2.3	.2
Milwaukee, Wis.	1920	81.0	17.7	1.3

[1] Figures furnished by the city registrars of vital statistics through correspondence. In a few cases printed reports were available. Cities of over 100,000 population in the birth-registration area for which figures were not obtained are omitted from the list.
[2] Information not available.

TABLE 57.—*Percentage of births attended by physicians and midwives in cities of 100,000 population and over; United States birth-registration area*—Contd.

City	Year	Per cent of births attended by—		
		Physicians	Midwives	Others, no attendant, or not reported
Minneapolis, Minn	1921	91.8	8.0	0.2
New Bedford, Mass	1919	(1)	38.3	(1)
New York City	1921	74.4	25.6	
Newark, N. J	1921	(1)	38.0	(1)
Oakland, Calif	1922	87.3	11.1	1.6
Paterson, N. J	1921	(1)	27.0	(1)
Philadelphia, Pa	1922	87.6	12.3	.1
Pittsburgh, Pa	1922	70.7	29.3	
Providence, R. I	1922	80.5	19.0	.5
Reading, Pa	1922	94.5	5.1	.4
Richmond, Va	1922	81.6	18.4	
St. Paul, Minn	1921	83.8	16.0	.2
Salt Lake City, Utah	1922	97.0	2.8	.2
San Francisco, Calif	1922	85.0	13.0	2.0
Spokane, Wash	1922	96.1	2.3	1.6
Syracuse, N. Y	1922	92.7	7.1	.2
Toledo, Ohio	1919	82.9	16.3	.8
Trenton, N. J	1921	(1)	29.0	(1)
Washington, D. C	1921	95.6	4.4	
Wilmington, Del	1922	69.0	22.9	8.1
Yonkers, N. Y	1922	76.9	22.6	.5

[1] Information not available.

Attendance by a physician does not necessarily insure the best care, nor does attendance by a midwife necessarily mean the poorest care; much depends upon the qualifications and training of the particular physician or midwife. Attention has already been called (see p. 75) to the fact that all States have minimum requirements for the admission of physicians to the practice of medicine, though in certain States the standards are low; but many States have no requirements for admission of midwives to practice, or if they have such standards do not enforce them, and one State (Massachusetts) does not even recognize the existence of midwives. Midwives who have been trained in recognized training schools either in this country or abroad are in an entirely different class from those who, often without even a common-school education, and with no special training in their profession, are sometimes found in attendance upon negro mothers in the Southern States. Nevertheless, even the midwife with the best of training is not qualified to take charge of complicated cases, and in such cases she should call in a physician.

Figures are available for certain areas which tend to show a decrease in the proportion of births attended by midwives. For example, in Minneapolis, St. Paul, and Milwaukee, one consequence of the increase in the proportion of births in hospitals, all of which are attended by physicians, is a decrease in the proportion of home confinements attended by midwives. Table 58 shows the proportion of births attended by midwives in Wisconsin. These figures, which are available for a series of years, show a decrease from 13 per cent of births so attended in 1915 to 6 per cent in 1922. In view of the great variety of conditions in different parts of the country, however, no generalizations can safely be drawn from statistics relating to two States only.

TABLE 58.—*Decrease in percentage of births attended by midwives; Minneapolis and St. Paul, Minn., Milwaukee, Wis., and the State of Wisconsin, 1913–1922*

Year	Per cent of births attended by midwives				Year	Per cent of births attended by midwives			
	Minneapolis [1]	St. Paul [1]	Milwaukee [2]	Wisconsin [3]		Minneapolis [1]	St. Paul [1]	Milwaukee [2]	Wisconsin [3]
1913	23	23	32	[4]	1918	12	19	22	11
1914	20	26	32	[4]	1919	11	21	21	10
1915	19	25	28	13	1920	9	19	17	8
1916	17	24	26	12	1921	8	16	15	7
1917	15	22	25	12	1922	7	13	13	6

[1] Compiled from "Results gained in maternity cases in which antenatal care has been given," by Fred L. Adair, M. D., and C. O. Maland, M. D., p. 11.
[2] Child Welfare Statistics, Milwaukee, Wis., p. 14.
[3] Compiled from annual reports of vital statistics.
[4] Figures not available.

Details in regard to the following aspects of the confinement and postnatal care received by mothers are available for two cities: The number of visits from physicians or midwives following delivery, the final examination before discharge, the type and duration of nursing care, the number of days spent in bed or in hospital following delivery, etc. The statistics relate to married mothers of children born in Baltimore in 1915 and in Gary, Ind., in 1916.

With regard to visits by the attendant during the confinement period "the usual arrangement reported in Baltimore, both in cases attended by physicians and in those attended by midwives, was a daily visit through the fourth day and at least one visit thereafter. Seven-eighths of the physicians' cases for which the visits were reported, and practically all the midwives' cases, fell into this group." [36]

The postnatal care received from physicians and midwives by the mothers in Gary, Ind., was classified into grades on the basis of the number and time of visits. To qualify in Grade A, daily visits through the fifth day, a visit on the seventh or eighth day, and another visit on the tenth or eleventh day were required; 30 per cent of the cases attended by physicians at delivery, as compared with 26 per cent of those attended by midwives, were classified as having had Grade A postnatal care. On the other hand, in Grade D, including cases in which only one visit besides the visit at delivery was made, were classified 6 per cent of the cases attended by physicians, but only 0.3 per cent of the midwives' cases. Furthermore, when cases which had at least daily visits through the fourth day (Grades A and B) are considered, 97 per cent of the cases attended by midwives satisfied these requirements, as compared with only 64 per cent of those attended by physicians. When both a physician and a midwife attended the case the care received was relatively poor, perhaps because neither attendant felt full responsibility.[37]

A final examination of a maternity patient six weeks after delivery was included in the minimum standards for the protection of the health of mothers which were adopted by the Washington and regional conferences on child-welfare standards.[38] In the study of

[36] Infant Mortality; results of a field study in Baltimore, Md., p. 213. For detailed tables see ibid., p. 214.
[37] Infant Mortality; results of a field study in Gary, Ind., p. 36.
[38] Minimum Standards for Child Welfare Adopted by the Washington and Regional Conferences on Child Welfare, p. 7.

infant mortality in Gary, special attention was paid to the question whether the mother had had an examination from four to six weeks after delivery before her case was discharged by the physician or other attendant at birth. Of the Gary mothers studied in 1916, only 8.6 per cent reported any final examination; of the patients attended by a physician only, or by both a physician and a midwife, 11.7 per cent were given a final examination by the physician, in four-fifths of the cases four weeks or more after delivery.[39] Of the mothers attended by midwives only 6.9 per cent were given a final examination, and in view of the midwives' limited training these examinations were probably not so thorough as those given by the average physician.

Nursing service, at home unless hospital care is given, at the time of confinement and during the lying-in period is included in the minimum standards to which reference has already been made. In the city of Baltimore in 1915, over one-fourth of all mothers were found to have had no nursing care; the proportion reporting nursing care, among whom were considered those confined in hospitals and those who had trained nurses, midwives, or practical nurses in attendance, was highest among the Polish mothers and lowest among the Italian mothers. In both these groups comparatively few mothers received any nursing care except that given by midwives (82 per cent of the Polish mothers were attended by midwives, who were considered as having given nursing care). The Jewish group had the largest proportion of mothers delivered in hospitals and the largest proportion attended by trained nurses at home. The proportion of mothers who had nursing care was found to have been highest in the group of families in which the fathers earned $2,850 and over, and lowest in the group in which the fathers earned less than $450. The duration of nursing care in Baltimore was found to have been relatively longer for the native white mothers than for foreign-born white or for colored mothers. Of the native white mothers, 31.5 per cent, as compared with 16.1 per cent of the foreign-born white mothers and with only 12.4 per cent of the colored mothers, had nursing care which lasted two weeks or more.[40]

Figures for Gary, Ind., show a much larger proportion (39.6 per cent) of cases in which the mothers received nursing care during at least the two weeks following confinement. A correlation is indicated between the duration of nursing care and the amount of father's earnings, since the proportion of cases in which such care was received for at least two weeks was nearly twice as high in families in which the father earned $1,850 or over as in families in which the father earned less than $1,050.

In the minimum standards for the protection of the health of mothers, at least 10 days' rest in bed after a normal delivery was specified as one requirement. In Baltimore in 1915 nearly one-third of the mothers reported they had stayed in bed less than 10 days (3.4 per cent reported less than 4 days). As would be expected, the proportion of these cases was highest in families in which the fathers had low annual earnings; 43.5 per cent of the mothers in families in which the father earned less than $450 stayed in bed less than 10 days,

[39] Infant Mortality; results of a field study in Gary, Ind., p. 36.
[40] Infant Mortality; results of a field study in Baltimore, Md., pp. 215, 216.

as compared with only 11 per cent in families in which the father earned $1,450 or over. Of the different nationality groups, the proportion of Polish and Italian mothers who stayed in bed less than 10 days after delivery was unusually high (74.7 per cent and 73.7 per cent, respectively). This proportion was lowest for the native white mothers and next lowest for the Jewish mothers (22.4 per cent and 25 per cent, respectively). In Gary, 54 per cent of the mothers remained in bed less than 10 days after delivery, a much larger proportion than in Baltimore. In the Gary study, as well as in that in Baltimore, a direct relationship was traceable between the time the mother spent in bed following confinement and the amount of the father's earnings.

This survey of the confinement and postnatal care received by mothers, fragmentary though the information is, indicates clearly that in the cities studied a comparatively small proportion of mothers received adequate care. If these conditions are at all typical, as they probably are, a vast amount of work remains to be done if all mothers are to receive the minimum protection which the conferences of experts on this subject considered essential.

GOVERNMENTAL RESPONSIBILITY

Governmental responsibility for the adequate protection of maternity is evidenced not only by protective legislation, which has already been discussed, but also by various types of measures for the provision of additional resources for such protection and for the better utilization of the resources available. Such measures take in general three forms: (1) Provision of more adequate resources for maternity care, such as better facilities for training personnel, and more adequate clinics, hospitals, and maternity homes; (2) subsidies in aid of State or local activities by Federal or State governments; and (3) educational work directed toward informing mothers of the need for adequate maternity care.[41]

Provision of resources for maternity care.

Governmental provision of resources for maternity care includes the maintenance and extension of educational facilities for physicians, nurses, and midwives, and the maintenance of hospitals, maternity homes, clinics, and other centers for prenatal and confinement care. Such provision may be made either by a local, State, or central government, or by a local government subsidized by a State or central government.

So far as the provision for educational facilities is concerned, many countries maintain out of public funds medical colleges for the training of physicians and schools for the training of midwives and nurses.

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[41] In Australia, for example, one aim, though not the principal one, sought in maternity-allowance legislation was the reduction of maternal mortality. The committee appointed to study the causes of death and invalidity in the Commonwealth in its report in 1917 on Maternal Mortality in Childbirth drew the general conclusion that the grant of maternity allowances is a very expensive method of attaining this end. The conclusion of the committee in its report was as follows:

"Speaking generally, your committee is of the opinion that much greater benefit could be obtained from the large sum of money spent annually than is being obtained under the present system, and that, as the wastage of life and damage to health now occurring in connection with childbearing is due to the ignorance of the mother and lack of skilled care, such improvement should be sought in two directions: (1) The provision of every facility for pregnant women to obtain skilled advice *before* the confinement occurs; (2) the provision of trained attention by a properly qualified and *properly supervised* midwife or nurse during the lying-in period." (Report on Maternal Mortality in Childbirth, p. 18. Committee concerning causes of death and invalidity in the Commonwealth. Australian Department of Trade and Customs [1917].)

In the United States medical schools are maintained in connection with many State universities and training schools for nurses in connection with many municipal hospitals.[42]

Provision of facilities for maternity care includes not only the establishment and maintenance of prenatal and maternity centers, clinics, hospitals, and maternity homes, but also the maintenance of medical and midwifery services for communities in which otherwise such services could not be obtained. Direct partial or complete support of practicing midwives in certain districts is given, for example, in England, where midwives are sometimes employed or their salaries guaranteed by local authorities in order that their services may be provided for areas in which they could not otherwise secure a living.[43]

Establishment and maintenance of hospitals has been generally recognized as a proper function of local government bodies. Many cities and counties in the United States maintain general hospitals, and some provide also special maternity hospitals. In general, every patient who is able to do so is expected to pay for the care received. The portion of the cost of maintenance of these hospitals which the cities contribute varies, therefore, from place to place and from time to time according to the policy of the institutions relative to taking nonpaying cases.

Maternity centers at which mothers may receive medical advice and prenatal care during pregnancy are not infrequently maintained by governmental agencies; for example, by local government boards in England, where they are subsidized by the central government through the health department.[44] In New Zealand the Royal Society for the Health of Women and Children, which maintains infant-welfare centers in many cities and which gives prenatal advice to many expectant mothers through its specially trained "Plunket" nurses, receives a substantial subsidy from the central government.[45]

In a few cities of the United States prenatal consultations are available to mothers at infant-welfare centers maintained by the municipalities.[46] According to the Report of the Committee on Municipal Health Department Practice, which summarized the results of a survey of the 83 largest cities in the United States, in 24 cities prenatal clinics were maintained in 1920 by the health departments, and in 12 other cities by combined municipal and private support.

Governmental subsidies.

Systems of subsidies by central governments, designed to promote and aid work for the protection of maternity by local governments are worthy of special consideration.

Perhaps the most extensive system of grants in aid of local activities is that in effect in England and Wales, the scope of which is described in the reports of the Ministry of Health and examples of which have already been cited. The grants for the fiscal year 1922–23 amounted to $3,821,195.27 (£785,204), of which over three-fourths

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[42] See Nursing and Nursing Education in the United States, p. 190 ff.

[43] Fourth Annual Report of the Ministry of Health [Great Britain], 1922-23, p. 15. Cmd. 1944.

[44] Infant-Welfare Work in Europe, by Nettie P. McGill, pp. 20–31. U. S. Children's Bureau Publication No. 76. Washington, 1921. See also Fourth Annual Report of the Ministry of Health [Great Britain], 1922–23, pp. 11–16.

[45] Infant Mortality and Preventive Work in New Zealand, by Robert M. Woodbury, p. 48. U. S. Children's Bureau Publication No. 105. Washington, 1922.

[46] Infant Hygiene, Report of the Committee on Municipal Health Department Practice, by I. V. Hiscock, pp. 114–115. Public Health Service Bulletin No. 136.

was paid to local government authorities and the rest to voluntary societies. In Table 59 are given the detailed objects of this expenditure in 1921–22. A considerable portion, though not all, was devoted to work for the protection of maternity. The department subsidizes expenditures for purposes specified in the regulations by a sum equal to 50 per cent of the approved net expenditure.

TABLE 59.—*Net expenditures of local authorities for purposes subsidized by the central government; England, 1921–1922*[1]

[One pound equals $4.8665]

Purpose	Amount of net expenditures		Per cent distribution
Total	£1,380,312	$6,717,288.35	100.0
Medical officers of health and assistant medical officers for maternity and child-welfare work	103,524	503,799.55	7.5
Health visitors, etc	420,399	2,045,871.73	30.5
Midwifery	51,805	252,109.03	3.8
Fees paid to doctors called in by midwives	28,596	139,162.43	2.1
Nurses	16,248	79,070.89	1.2
Centers	147,510	717,857.42	10.7
Day nurseries	44,977	218,880.57	3.3
Maternity homes and hospitals	206,446	1,004,669.46	15.0
Infants' hospitals			
Convalescent homes	5,644	27,466.53	.4
Milk and food	280,946	1,367,223.71	20.4
Home helps	7,041	34,265.03	.5
Establishment and miscellaneous expenses	67,176	326,912.00	4.9

[1] Fourth Annual Report of the Ministry of Health [Great Britain], 1922–23, pp. 12–13. London, 1923.

A brief statement of the scope of the work in England may be of interest. The number of local authorities which administer schemes of maternity and child welfare is 436, including the 49 county councils, the 78 county borough councils, the 28 metropolitan borough councils, and 281 councils of noncounty boroughs and urban and rural districts. Among them these councils cover the whole of England. For the supervision of this work 196 assistant medical officers of health have been appointed. On March 31, 1923, health visitors numbered 3,508, of whom 893 were employed wholly in promoting maternity and child welfare and 1,124 combined these duties with other public-health activities of a similar character. The work included provision of an adequate service of qualified midwives in every district which in many cases required the employment of a midwife out of public funds, the giving of a subsidy, or the guaranteeing of the midwife's salary. The maintenance of maternity and infant-welfare centers was a very important branch of health work; each health visitor's district was served, whenever practicable, by such a center. The number of these centers in England alone at the close of the fiscal year 1923 was 1,950. Maternity beds in hospitals and in homes subsidized by the department numbered 1,879 in 128 such hospitals and homes. In addition, homes for mothers and babies numbered 100 and contained beds for 1,334 mothers and 1,288 babies. Other work included maintenance of children's hospitals and homes for convalescents, provision of milk at less than the cost price to expectant and nursing mothers and to young children, and inspection of foster homes for children.[47]

[47] Fourth Annual Report of the Ministry of Health [Great Britain], 1922–23, pp. 11–17.

In the United States the Federal Government grants funds to States which accept the provisions of the Sheppard-Towner Act [48] for the promotion of the welfare and hygiene of maternity and infancy. The total appropriation for carrying out the provisions of this act during the first full year of its operation was $1,240,000, of which each State accepting the act received (1) $5,000 outright, (2) $5,000 more if it appropriated an equal amount, and (3) its share of the remaining fund of $710,000 which is apportioned to the States on the basis of population, if matched by State appropriations.[49] The conditions for grants have been accepted by the State legislatures of 43 States.[50]

Under the act each State is allowed to develop its own plans for the expenditure of the funds allotted to it. The plans are subject to the approval of a board consisting of the Chief of the Children's Bureau, the Surgeon General of the Public Health Service, and the Commissioner of Education; if these plans are in conformity with the provisions of the act and are reasonably appropriate and adequate to carry out its purposes the board must approve them. The law provides that no part of the Federal funds may be used for the purchase, rental, or maintenance of any building or equipment, nor may either Federal funds or State moneys appropriated to match the Federal allotment be used for the payment of maternity allowances. The act is, therefore, clearly directed toward educational measures, especially toward stimulating the appropriate State agencies to undertake educational work.

Educational work.

The importance of educational measures directed toward informing the public in general and mothers in particular of the need for adequate medical supervision during pregnancy and nursing and medical care during confinement is indicated by the figures given in the preceding section (see pp. 83–92) showing the large proportion of mothers who do not now receive adequate supervision and care—in many cases, probably, because they do not appreciate the need for it. Only by the education of the public will it be possible to awaken the demand for and call forth resources in trained personnel and facilities sufficient to give adequate protection to every mother during pregnancy and confinement.

To a large degree all the activities of State and local public and private health agencies are educational. The giving of prenatal care by child-welfare centers and by visiting nurses has an important educational aspect. In the annual report of the administration of the Sheppard-Towner Act for 1924 [51] it is stated that "children's health centers or health conferences and prenatal or maternity centers or conferences are everywhere recognized as the best teaching agencies." In most of the States consequently efforts are being directed toward

[48] Enacted November 23, 1921; for text of act see U. S. Children's Bureau Publication No 95 (Washington, 1922).

[49] The balance of $50,000 was allowed the U. S. Children's Bureau for expenses of administration.

[50] During the first three months after the passage of the act 12 States accepted through legislative enactment, and 30 through the approval of the governor pending the meeting of the legislatures. For a full discussion of the work undertaken under the Sheppard-Towner Act see the reports on The Promotion of the Welfare and Hygiene of Maternity and Infancy (U. S. Children's Bureau Publications Nos. 137 and 146, Washington, 1924 and 1925). See also Federal Aid for the Protection of Maternity and Infancy, by Grace Abbott (revised reprint from the American Journal of Public Health, September, 1922); and The Sheppard-Towner Act in Relation to Public Health, by Anna E. Rude, M. D. (paper read before the section on preventive and industrial medicine and public health at the Seventy-Third Annual Session of the American Medical Association, St. Louis, May, 1922).

[51] The Promotion of the Welfare and Hygiene of Maternity and Infancy, p. 4. U. S. Children's Bureau Publication No. 146. Washington, 1925.

state-wide establishment of permanent locally supported children's health centers and prenatal centers accessible to all the population in need of such assistance and instruction. A "center" is to be interpreted as an established time and place at which a physician and nurse are present for the examination of children and the instruction of mothers on the essentials in the feeding and care of babies and children of preschool age. The usefulness of such a health center is usually demonstrated by single health conferences held by county "health units" consisting of at least a physician and nurse, often a dentist also and still other assistants. Frequently, not only the personnel of the county health unit but its whole equipment is itinerant, as indicated by such popular terms as "healthmobile," "health caravan," "traveling dental ambulance," "health movie truck," etc.

Auxiliary to conferences and the activities in centers are the scarcely less important "home visits" by which the public-health nurse follows up the work previously done, emphasizing and explaining facts made known in the examinations, giving further instruction and demonstrations of the kind of care needed in individual cases, and advice on methods of accomplishing the indicated corrections.

Instruction on prenatal care in many States is given in connection with child-health conferences and centers, yet there were 6,088 prenatal conferences, reported by workers under the Sheppard-Towner Act, with an attendance of 38,662 women.[52] The importance of prenatal care is not appreciated by a very large part of the public, and in many parts of the United States women do not have medical supervision during pregnancy nor medical care during confinement and the lying-in period. However, the technique and unit costs of the prenatal conference, already learned for urban districts, are being worked out for rural districts through State activities, and the necessary modifications are being noted.

The Fourth Annual Report of the Ministry of Health of Great Britain thus calls attention to the educational value of such health centers for mothers and infants: "It can not be emphasized too strongly that the main object of the center is preventive and educational and that its primary aim should therefore be to provide advice and teaching for the mothers together with supervision of the healthy infant, rather than treatment for the sick." [53]

Another method of disseminating information consists of the distribution of pamphlets and leaflets of instruction. This has been one of the activities of the Children's Bureau since its establishment in 1912. Especial mention may be made of one of its first bulletins, a popular pamphlet on prenatal care.[54] This bulletin sets forth the need for prenatal care and gives in clear language the simple hygienic principles which every expectant mother should know and follow. Especial emphasis is placed upon the necessity for early consultation with a doctor. During the years from 1915 to 1925 over a million and a half copies of this pamphlet—averaging 140,000 annually—were distributed throughout the country. Another bulletin which should be mentioned in this connection is a study of maternal mortality,[55] which calls attention to the unusually high maternal mortality

[52] Ibid., p. 9.
[53] Fourth Annual Report of the Ministry of Health [Great Britain], 1922–23, p. 15.
[54] Prenatal Care, by Mrs. Max West. U. S. Children's Bureau Publication No. 4. Washington, 1915.
[55] Maternal Mortality, by Grace Meigs, M. D. U. S. Children's Bureau Publication No. 19 Washington, 1917.

rate in the United States and furnishes a statistical measure of the need for the movement to protect maternity.

Bulletins on prenatal care have been issued by some State bureaus,[56] and distributed by them in addition to, or in connection with, their wide distribution of copies of publications of the Federal Children's Bureau. Many local health departments also provide mothers with pamphlets on prenatal as well as infant care.[57]

In many States correspondence courses for mothers are conducted. These vary from regular instruction for a registry of mothers to the mere monthly distribution of a series of prenatal letters to mothers who request them, or whose names are furnished to the State bureau by physicians or nurses.

Lectures, some of which are illustrated by model equipment, by slides, or by motion pictures, have formed a satisfactory method of instruction; special films dealing with prenatal, infant, and child care have been prepared and their showing has met with appreciation and interest. Articles on infant and child care have been accepted and published by local and county papers and by magazines of both technical and popular character; and the radio talks on prenatal, infant, and child care already reported in some States are an indication of the coming use of a new medium for disseminating instruction on maternal and infant care.

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[56] Bureaus or divisions of child hygiene or child welfare are functioning in all the States, nearly all of them now cooperating with the Federal Children's Bureau under the Sheppard-Towner Act. Most of these bureaus were established during the period from 1915 to 1922, largely as a result of the "children's year" campaign for the better protection of the health of children. Before 1918 there were child-hygiene divisions in 7 States. Such divisions were established in 4 States in 1918, in 17 in 1919, in 7 in 1920, in 3 in 1921, and in 8 in 1922.

[57] In this connection the example of New Zealand may be cited: In that country for years registrars have provided each mother on the registration of birth of her first child with a copy of a special pamphlet entitled "The Expectant Mother and Baby's First Month," which contains simple rules for the health of mothers. Recently the registrars have been instructed to give a copy to each man who applies for a marriage license, and the Health Department has undertaken the task of sending copies to every married woman under 35 years of age in New Zealand. Annual Report of the Royal New Zealand Society for the Health of Women and Children, pp. 4–5. Dunedin, 1922.

NEED FOR INFORMATION

At many points in the preceding discussion the inadequacy of the information at hand has been evident. Statistics of puerperal mortality are not available for the whole country, but only for the death-registration area, and even for this area they are subject to qualifications and interpretation. Practically no evidence is available with regard to so important a group as deaths following self-induced abortion, though without information on this point it is impossible to determine how much of the mortality could be prevented by rigorous asepsis in obstetrical work and how much must be controlled by other types of measures. Information is also lacking as to the number of obstetrical operations, the indications upon which they are performed, and the mortality following each type of operation, as well as complete information concerning the prevalence of the various kinds of complications. Only when such data are available will it be possible to judge accurately the nature of the problems of puerperal mortality and morbidity and the best methods for reducing them to a minimum.

Not only is information unavailable regarding many important details connected with puerperal mortality, but data on the public-health aspects of the problem are likewise in large part lacking. Data, for example, concerning the proportion of births which are attended by physicians, midwives, and other persons are far from comprehensive. Many States are ignorant of the number, as well as the qualifications, of midwives practicing in their territory. The proportion of births in hospitals is available for relatively few areas. Furthermore, data on the quality of care received by mothers are extremely limited.

On all these and other points relating to childbirth information is needed, not only to aid in a thorough understanding of the problems to be dealt with, but also to suggest fruitful methods of approach, and to aid in guiding the adoption of control measures.

On the other hand, the value of the statistics already available is not always fully appreciated, nor are these statistics always used in the most effective ways to aid in establishing control over puerperal mortality and morbidity. The methods by which vital statistics can be utilized in preventive work may be considered here briefly.

From the vital statistics of a community the health administration can secure prompt information as to the causes from which the death rate is excessively or unusually high and in the light of this knowledge can take necessary steps to prevent or reduce this excessive mortality. This requires, of course, an accurate measure of the death rate, to furnish which in the case of puerperal mortality the complete recording of both births and deaths is required.

The use by the health department of records of cases, or if all cases are not reportable, of deaths from puerperal septicemia offers manifest possibilities. The occurrence of this disease in the practice of physicians or midwives gives an immediate clue to where effective control work can be applied. An example of such control may be

found in the Prussian regulations governing the practice of midwives, which prescribe that a midwife who has had a case of septicemia must follow a definite procedure of disinfection and may be forbidden by the local health officer to practice her profession until after the expiration of a stated period.[1] Another example of the effective use of such reports is found in the practice of the New Zealand health department of investigating promptly each case of puerperal septicemia that occurs in a private hospital, a procedure which is followed, when necessary, by the temporary closing of the hospital or by the revocation of the license to operate. With alert public-health administration the occurrence of a series of cases of puerperal septicemia in the practice of a single physician or midwife should be entirely eliminated.[2]

Another effective method of utilizing vital statistics to aid in the prevention of maternal mortality is that used for a time by one of the State health departments in the United States of sending to the physician in attendance in case of each death from puerperal causes a questionnaire designed to bring out on the one hand a complete statement of the factors complicating the pregnancy or confinement, and on the other the possibilities of reducing such mortality by more adequate hospital care, by earlier consultation with a physician, or by changes in methods of treatment.

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[1] See in this connection, "Kindbettfieber und Kindbettsterblichkeit," by W. Weinberg, p. 588, in Handwörterbuch der Sozialen Hygiene, vol. 1 (Dr. A. Grotjahn and Prof. Dr. J. Kaup, Leipzig, 1912).

[2] Reference may be made here to the movement for greater stress on obstetrics in medical education. See, for example, "The midwife problem and medical education in the United States," by J. Whitridge Williams, M. D., in Transactions of the American Association for Study and Prevention of Infant Mortality, 1911, p. 182; also Maternal Morbidity and Mortality in the United States, by Geo. Clark Mosher, M. D. (Reprint from the American Journal of Obstetrics and Gynecology, Vol. VII, No. 3 (March, 1924), pp. 6–7).

APPENDIXES

APPENDIX A.—RULES FOR THE CLASSIFICATION OF PUERPERAL CAUSES OF DEATH IN USE BY THE BUREAU OF THE CENSUS [1]

PART I.—PRIMARY CAUSES

The following list contains the details of the titles included under the eight groups of pathological causes of puerperal deaths in the International List of Causes of Death in use by the Bureau of the Census: (1) Accidents of pregnancy; (2) puerperal hemorrhage; (3) other accidents of labor; (4) puerperal septicemia; (5) puerperal phlegmasia alba dolens, embolus, sudden death; (6) puerperal albuminuria and convulsions; (7) following childbirth, not otherwise defined; and (8) puerperal diseases of the breast.

1.—143 (134) ACCIDENTS OF PREGNANCY [2]

(a) Abortion.

Abortion.
Accidental abortion.
Immature birth.
Immaturity.
Induced abortion.
Induced premature labor.
Miscarriage.
Missed abortion.
Premature birth.
delivery.

(b) Ectopic gestation.

Abdominal pregnancy.
Ablation of pregnant tube.
Ectopic gestation.
pregnancy.
Extrauterine gestation.
pregnancy.
Interstitial pregnancy.
Rupture of sac (ectopic gestation).
(tubal pregnancy).
Tubal abortion.
gestation.
pregnancy.

(c) Others under this title.

(1)

Accidental hemorrhage of pregnancy.
Antepartum hemorrhage.
Carneous mole connected with pregnancy.
Chorea gravidarum.
of pregnancy.
Cornual pregnancy.
Dead fetus in uterus.
Evacuation of uterus.
Hemorrhage of pregnancy.
Hemorrhagic mole.

(c) Others under this title.—Con.

Hydatid mole.
Hydatidiform mole.
Missed labor.
Molar pregnancy.
Mole (pregnancy).
Retention of dead ovum.
Vesicular mole.

(2)

Accident of pregnancy.
Cyesis.
Displacement of pregnant uterus.
Dropsy of amnion.
Emesis gravidarum.
Gestation.
Hydramnios (mother).
Hydrops amnii.
Hydrorrhea gravidarum.
in pregnancy.
Hyperemesis gravidarum.
of pregnancy.
Hysteralgia of pregnant uterus.
Menstruation during pregnancy.
Multiple pregnancy.
Neuralgia of pregnant uterus.
Pernicious vomiting (female, 15y–44y).
Persistent vomiting (pregnancy).
Pregnancy.
in abnormally formed uterus.
Prolapse of pregnant uterus.
Puerperal vomiting.
Retroversion of pregnant uterus.
Spurious labor pains.
Uncontrollable vomiting (female, 15y–44y) of pregnancy.
Vomiting of pregnancy.

[1] From Manual of the International List of Causes of Death, Based on the Third Revision by the International Commission, Paris, October 11 to 15, 1920, pp. 116–120 (the numbers of the third revision are given followed by the numbers of the second revision in parenthesis); and from Manual of Joint Causes of Death, Second Edition, pp. 51, 52. (U. S. Bureau of the Census, Washington, 1924 and 1925.)

[2] Does not include puerperal septicemia during pregnancy, 146 (137); nephritis of pregnancy, 148 (138). In the second revision no subgroups were shown. In the third revision the following titles were included in accidents of pregnancy which were not included in the second revision: Chorea gravidarum, chorea of pregnancy (transferred from "puerperal albuminuria and convulsions"), Hydatid mole, hydatidiform mole (transferred from "cancer and other malignant tumors of the female genital organs"), and dead fetus in uterus.

2.—144 (135) PUERPERAL HEMORRHAGE

Accidental hemorrhage of parturition.
puerperium.
Adherent placenta.
Apoplexy of placenta.
Detachment of placenta.
Hemorrhage after labor.
during parturition.
from detachment of placenta.
uterus after parturition.
during parturition.
puerperium.
Malposition of placenta.
Placenta praevia.
Postpartum hemorrhage.
Puerperal hemorrhage.
metrorrhagia.
uterine hemorrhage.
Retained membrane.
placenta.
secundines.
Retention of placenta.
Separation of placenta.
Vicious insertion of placenta.

3.—145 (136) OTHER ACCIDENTS OF LABOR[3]

(a) Cesarean section.
Cesarean section.
Porro's operation.
(b) Other surgical operations and instrumental delivery.
Application of forceps.
Cephalotomy.
Cephalotripsy.
Craniotomy.
Embryotomy.
Forceps operation.
Hebotomy.
Instrumental delivery.
Laparoelytrotomy.
Obstetric operation.
Symphysiotomy.
(c) Others under this title.

(1)

Diruptio uteri.
Laceration of peritoneum (parturition).
urinary bladder (parturition).
Metrorrhexis.
Puerperal apoplexy.
metrorrhexis.
perforation of uterus.
Rupture of bladder (parturition).
uterus (parturition).

(2)

Abnormal labor.
parturition.
Accident of labor.
Atony of uterus during parturition.
Breech presentation.
Deformed pelvis (female, 15y–44y).
Delayed delivery.
Difficult labor.
Dystocia.
Faulty presentation.
Foot presentation.

(c) Others under this title.—Con.
Forced delivery.
Inertia of uterus.
Injury in delivery.
Inversion of uterus during parturition.
Malpresentation.
Multiple birth.
parturition.
Postpartum curettement.
Prolonged labor.
Protracted labor.
Retarded labor.
Transverse presentation.
Version (during labor).

(3)

Accouchement.
Childbed.
Childbirth.
Confinement.
Consequence of labor.
Disease of placenta.
Fistula from parturition.
Hematoma of vulva (puerperium).
Labor (unqualified).
Laceration of cervix.
pelvic floor.
perineum.
(parturition).
uterus (parturition).
vagina (parturition).
vulva (parturition).
Overdistention of uterus.
Parturition.
Perineorrhaphy.
Postpuerperal shock.
Puerperal hematoma of vulva.
Result of labor.
Rupture of perineum (parturition).
vagina (parturition).
vulva (parturetion).
Shock of birth.
Subinvolution of uterus.

[3] In the second revision no subgroups were shown. In the third revision the following titles were added: "Laceration of pelvic floor," "obstetric operation," "overdistention of uterus."

4.—146 (137) PUERPERAL SEPTICEMIA[4]

Childbed fever.
Decidual endometritis.
Infected tubal pregnancy
Metritis of pregnancy.
Milk fever (female).
Postabortive sepsis.
Postpartum pyemia.
sepsis.
septicemia.
Puerperal[5] abscess.
abscess of broad ligament.
cellulitis.
endometritis.
erysipelas.
fever.
infection.
inflammation of uterus.
lymphangitis.
metritis.
metroperitonitis.
metrosalpingitis.
parauterine abscess.
pelvic cellulitis.
pelvic peritonitis.
Puerperal[5] pelviperitonitis.
perimetritis.
perimetrosalpingitis.
peritoneal infection.
peritonitis.
periuterine cellulitis.
phlegmon of broad ligament.
purulent endometritis.
pyemia.
pyohemia.
pyrexia.
salpingitis.
sapremia.
sepsis.
septic endometritis.
fever.
infection.
intoxication.
metritis.
peritonitis.
septicemia.
suppurative metritis.
Septicemia following abortion.[6]

5.—147 (139) PUERPERAL PHLEGMASIA ALBA DOLENS, EMBOLUS, SUDDEN DEATH[7]

Milk-leg (female).
Puerperal embolism.
embolism of lung.
phlebitis.
phlegmasia alba dolens.
pulmonary embolism.
sudden death.
syncope.
thrombosis.
Sudden death after delivery.
from cardiac embolism after delivery.
thrombosis after delivery.
cerebral hemorrhage after delivery.
embolism after delivery.
Sudden death from entrance of air into vein after delivery.
nervous exhaustion after delivery.
pulmonary embolism after delivery.
pulmonary thrombosis after delivery.
shock after delivery.
thrombosis after delivery.
in puerperium.
Venous thrombosis consequent on parturition.
White-leg (female, 15y–44y).

[4] Does not include: Septicemia (unqualified) except in connection with childbirth, 41 (20); puerperal scarlatina, 8 (7).
[5] Any of the conditions following are compiled as puerperal when returned in connection with abortion, miscarriage, childbirth, labor, etc., even if not definitely so stated.
[6] Added on the third revision.
[7] Does not include: Phlegmasia alba dolens (nonpuerperal), 92 (82). A frequent complication is gangrene in the second revision "embolism" was stated as a frequent complication.

6.—148 (138) PUERPERAL ALBUMINURIA AND CONVULSIONS[8]

Albuminuria of pregnancy.
Eclampsia gravidarum.
of labor.
pregnancy.
Nephritis of pregnancy.
Postpartum eclampsia.
Postpuerperal nephritis.
Puerperal albuminuria.
anuria.
Bright's disease.
coma.
convulsions.
cramps.
dropsy.
eclampsia.
nephritis.
Puerperal spasms.
tetanus.
toxemia.
uremia.
uremic coma.
convulsions.
delirium.
dementia.
eclampsia.
intoxication.
poisoning.
Pyelitis of pregnancy.
Pyelonephritis of pregnancy.
Toxemia of pregnancy.
Uremia of pregnancy.

7.—149 (140) FOLLOWING CHILDBIRTH (NOT OTHERWISE DEFINED)[9]

Following childbirth.
Puerperal accident.
displacement of uterus.
insanity.
mania.
Puerperal melancholia.
state.
Puerperium.
Result of labor (without further explanation).

8.—150 (141) PUERPERAL DISEASES OF THE BREAST[10]

Abscess of the breast following parturition.
Fissure of nipple, puerperium.
Fistula of breast (puerperal or unqualified).
Galactocele.
Galactorrhea.
Mammary fistula.
Puerperal abscess of breast.
mammary gland.
diffuse mastitis.
Puerperal disease of breast.
fissure of nipple.
fistula of breast.
mammary gland.
galactophoritis.
inflammation of areola.
breast.
mammary abscess.
mammitis.
mastitis.

Note.—The purpose of the foregoing group of titles 143–150 (134–141) is to include all deaths of women due more or less directly to childbearing. The terms are to be understood in all cases to apply to the death of the mother (certain terms which may also designate the death of the child may be found in the index in use by the Bureau of the Census). The word "puerperal" is used in the broadest sense to include all affections dependent upon pregnancy, parturition, and also diseases of the breast during lactation. It is to be understood as a qualification of every term included in this group and is so expressed in the index for many terms that might or might not be puerperal.

The fact that childbirth occurred within a month previous to death should always be stated even though it may not have been a cause of death. It is preferable to show the direct connection, when it exists, as by writing "puerperal septicemia," "peritonitis following labor," etc., although the separately stated joint causes "childbirth" and "septicemia," or "parturition" and "peritonitis" would lead, by interpretation, to the same statistical assignment. Whenever a woman of childbearing age (approximately 15 to 44 years), especially if married, is reported to have died from any of the following causes which might have been puerperal, the local registrar should endeavor to obtain a definite statement from the reporting physician:

[8] Does not include: Puerperal scarlatina, 8 (7). In the second revision "chorea of pregnancy" was included in this group. In the third revision the titles "pyelitis of pregnancy" and "pyelonephritis of pregnancy" were added, and chorea of pregnancy transferred to No. 143c.
[9] Does not include: Nonpuerperal sudden death, 204 (188); puerperal scarlatina, 8 (7).
[10] In the third revision the title "inflammation of areola" was added.

Abscess of the breast.
Albuminuria.
Cellulitis.
Coma.
Convulsions.
Eclampsia.
Embolism.
Gastritis.
Hemorrhage (uterine or unqualified).
Lymphangitis.
Metritis.
Metroperitonitis.
Metrorrhagia.
Nephritis.[11]
Pelviperitonitis.
Peritonitis.[11]
Phlebitis.
Phlegmasia alba dolens.
Pyemia.
Septicemia.
Sudden death.
Tetanus.
Thrombosis.
Uremia.[11]

The diseases included under titles 128 (119), 133 (124), 138 (128), 140 (130), 141 (132), and 142 (133) are understood to be nonpuerperal (or unqualified). Many deaths so compiled are, in fact, due to puerperal conditions; hence the importance of a definite statement in all cases concerning which there can be a reasonable doubt. The proportion of the "unqualified" should diminish with fuller cooperation of physicians and more effective administration of registration offices.

PART II.—JOINT CAUSES

If more than one cause of death is stated on the death certificate, the procedure followed by the Bureau of the Census is to assign each cause to its International List number and then to determine the preferred cause in accordance with the rules for the classification of such cases. The only combination of causes with which this report is concerned is that of a puerperal with a nonpuerperal cause. For reference the International List of Causes of Death with their numbers follows, and also each puerperal cause with the nonpuerperal causes which are preferred to it when they appear together on a death certificate is cited by its International List number. In case of combination with other nonpuerperal causes the numbers of which are not given, the puerperal cause is preferred. (Some subdivisions used in combinations are not shown.)

INTERNATIONAL LIST OF CAUSES OF DEATH WITH NUMBERS

1. Typhoid and paratyphoid fever.
2. Typhus fever.
3. Relapsing fever (spirillum obermeieri).
4. Malta fever.
5. Malaria.
6. Smallpox.
7. Measles.
8. Scarlet fever.
9. Whooping cough.
10. Diphtheria.
11. Influenza.
12. Miliary fever.
13. Mumps.
14. Asiatic cholera.
15. Cholera nostras.
16. Dysentery.
17. Plague.
18. Yellow fever.
19. Spirochetal hemorrhagic jaundice.
20. Leprosy.
21. Erysipelas.
22. Acute anterior poliomyelitis.
23. Lethargic encephalitis.
24. Meningococcus meningitis.
25. Other epidemic and endemic diseases.
26. Glanders.
27. Anthrax.
28. Rabies.
29. Tetanus.
30. Mycoses.
31. Tuberculosis of the respiratory system.
32. Tuberculosis of the meninges and central nervous system.
33. Tuberculosis of the intestines and peritoneum.
34. Tuberculosis of the vertebral column.
35. Tuberculosis of the joints.
36. Tuberculosis of other organs.
37. Disseminated tuberculosis.
38. Syphilis.
39. Soft chancre.
40. Gonococcus infection.
41. Purulent infection, septicemia.
42. Other infectious diseases.
43. Cancer and other malignant tumors of the buccal cavity.
44. Cancer and other malignant tumors of the stomach, liver.
45. Cancer and other malignant tumors of the peritoneum, intestines, rectum.
46. Cancer and other malignant tumors of the female genital organs.
47. Cancer and other malignant tumors of the breast.
48. Cancer and other malignant tumors of the skin.
49. Cancer and other malignant tumors of other or unspecified organs.
50. Benign tumors and tumors not returned as malignant (tumors of the female genital organs excepted).
51. Acute rheumatic fever.

[11] Added in third revision.

52. Chronic rheumatism, osteoarthritis, gout.
53. Scurvy.
54. Pellagra.
55. Beriberi.
56. Rickets.
57. Diabetes mellitus.
58. Anemia, chlorosis.
59. Diseases of the pituitary gland.
60. Diseases of the thyroid gland.
61. Diseases of the parathyroid glands.
62. Diseases of the thymus gland.
63. Diseases of the adrenals (Addison's disease).
64. Diseases of the spleen.
65. Leukemia and Hodgkin's disease.
66. Alcoholism (acute or chronic).
67. Chronic poisoning by mineral substances.
68. Chronic poisoning by organic substances.
69. Other general diseases.
70. Encephalitis.
71. Meningitis.
72. Tabes dorsalis (locomotor ataxia).
73. Other diseases of the spinal cord.
74. Cerebral hemorrhage, apoplexy.
75. Paralysis without specified cause.
76. General paralysis of the insane.
77. Other forms of mental alienation.
78. Epilepsy.
79. Convulsions (nonpuerperal; 5 years and over).
80. Infantile convulsions (under 5 years of age).
81. Chorea.
82. Neuralgia and neuritis.
83. Softening of the brain.
84. Other diseases of the nervous system.
85. Diseases of the eye and annexa.
86. Diseases of the ear and of the mastoid process.
87. Pericarditis.
88. Endocarditis and myocarditis (acute).
89. Angina pectoris.
90. Other diseases of the heart.
91. Diseases of the arteries.
92. Embolism and thrombosis (not cerebral).
93. Diseases of the veins (varices, hemorrhoids, phlebitis, etc.).
94. Diseases of the lymphatic system (lymphangitis, etc.).
95. Hemorrhage without specified cause.
96. Other diseases of the circulatory system.
97. Diseases of the nasal fossae and their annexa.
98. Diseases of the larynx.
99. Bronchitis.
100. Broncho-pneumonia.
101. Pneumonia.
102. Pleurisy.
103. Congestion and hemorrhagic infarct of the lung.
104. Gangrene of the lung.
105. Asthma.
106. Pulmonary emphysema.
107. Other diseases of the respiratory system (tuberculosis excepted).
108. Diseases of the mouth and annexa.
109. Diseases of the pharynx and tonsils (including adenoid vegetations).
110. Diseases of the esophagus.
111. Ulcer of the stomach and duodenum.
112. Other diseases of the stomach (cancer excepted).
113. Diarrhea and enteritis (under 2 years of age).
114. Diarrhea and enteritis (2 years and over).
115. Ancylostomiasis.
116. Diseases due to other intestinal parasites.
117. Appendicitis and typhlitis.
118. Hernia, intestinal obstruction.
119. Other diseases of the intestines.
120. Acute yellow atrophy of the liver.
121. Hydatid tumor of the liver.
122. Cirrhosis of the liver.
123. Biliary calculi.
124. Other diseases of the liver.
125. Diseases of the pancreas.
126. Peritonitis without specified cause.
127. Other diseases of the digestive system (cancer and tuberculosis excepted).
128. Acute nephritis (including unspecified under 10 years of age).
129. Chronic nephritis (including unspecified 10 years and over).
130. Chyluria.
131. Other diseases of the kidneys and annexa.
132. Calculi of the urinary passages.
133. Diseases of the bladder.
134. Diseases of the urethra, urinary abscess, etc.
135. Diseases of the prostate.
136. Nonvenereal diseases of the male genital organs.
137. Cysts and other benign tumors of the ovary.
138. Salpingitis and pelvic abscess (female).
139. Benign tumors of the uterus.
140. Nonpuerperal uterine hemorrhage.
141. Other diseases of the female genital organs.
142. Nonpuerperal diseases of the breast (cancer excepted).
143. Accidents of pregnancy.
144. Puerperal hemorrhage.
145. Other accidents of labor.
146. Puerperal septicemia.
147. Puerperal phlegmasia alba dolens, embolus, sudden death.

148. Puerperal albuminuria and convulsions.
149. Following childbirth (not otherwise defined).
150. Puerperal diseases of the breast.
151. Gangrene.
152. Furuncle.
153. Acute abscess.
154. Other diseases of the skin and annexa.
155. Diseases of the bones (tuberculosis excepted).
156. Diseases of the joints (tuberculosis and rheumatism excepted).
157. Amputations.
158. Other diseases of the organs of locomotion.
159. Congenital malformations (stillbirths not included).
160. Congenital debility, icterus, and sclerema.
161. Premature birth; injury at birth.
162. Other diseases peculiar to early infancy.
163. Lack of care.
164. Senility.
165. Suicide by solid or liquid poisons (corrosive substances excepted).
166. Suicide by corrosive substances.
167. Suicide by poisonous gas.
168. Suicide by hanging or strangulation.
169. Suicide by drowning.
170. Suicide by firearms.
171. Suicide by cutting or piercing instruments.
172. Suicide by jumping from high places.
173. Suicide by crushing.
174. Other suicides.
175. Poisoning by food.
176. Poisoning by venomous animals.
177. Other acute accidental poisonings (gas excepted).
178. Conflagration.
179. Accidental burns (conflagration excepted).
180. Accidental mechanical suffocation.
181. Accidental absorption of irrespirable, irritating, or poisonous gas.
182. Accidental drowning.
183. Accidental traumatism by firearms (wounds of war excepted).
184. Accidental traumatism by cutting or piercing instruments.
185. Accidental traumatism by fall.
186. Accidental traumatism in mines and quarries.
187. Accidental traumatism by machines.
188. Accidental traumatism by other crushing (vehicles, railways, landslides, etc.).
189. Injuries by animals (not poisoning).
190. Wounds of war.
191. Execution of civilians by belligerent armies.
192. Starvation (deprivation of food or water).
193. Excessive cold.
194. Excessive heat.
195. Lightning.
196. Other accidental electric shocks.
197. Homicide by firearms.
198. Homicide by cutting or piercing instruments.
199. Homicide by other means.
200. Infanticide (murder of infants less than 1 year of age).
201. Fracture (cause not specified).
202. Other external violence.
203. Violent deaths of unknown causation.
204. Sudden death.
205. Cause of death not specified or ill-defined.

PREFERENCE OF NONPUERPERAL CAUSES WHEN RETURNED IN COMBINATION WITH PUERPERAL CAUSES

143 (a). Abortion.

The following nonpuerperal causes are preferred.—1 to 6 inc., 8 to 10 inc., 14, 16b, 17, 18, 20, 21 [12], 22 to 24 inc., 25c1, 26 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 40 [14], 43 to 49 inc., 54, 55, 57, 59, 60b1, 63, 65, 67a, 67b1, 68a, 72, 73, 76, 84a, 90a, 91a, 91c1, 92 [15], 111a1, 111b1, 112a, 116a1, 116c1, 117a, 118a1, 118b, 120, 121, 122a, 122b1, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

143 (b). Ectopic gestation.

The following nonpuerperal causes are preferred.—1, 2, 6, 8, 10, 14, 17, 18, 20, 21 [12], 22 to 24 inc. 25c1, 26 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 43 to 49 inc., 54, 55, 63, 65, 72, 76, 111a1, 111b1, 112a, 116a1, 116c1, 120, 121, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

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[12] Assign to 146 unless erysipelas is known to have preceded delivery.
[13] Assign to 148.
[14] Gonococcic peritonitis and gonococcic salpingitis assign to 146.
[15] Assign to 147.

143 (c1). Other accidents of pregnancy.

The following nonpuerperal causes are preferred.—1 to 6 inc., 8 to 10 inc., 14, 16b, 17, 18, 20, 21 [12], 22 to 24 inc., 25c1, 26 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 40a [14], 40b, 43 to 49 inc., 54, 55, 57, 59, 60b1, 63, 65, 67a, 67b1, 68a, 72, 73, 76, 84a, 90a, 91a, 91c1, 92 [15], 111a1, 111b1, 112a, 116a1, 116c1, 117a, 118a1, 118b, 120, 121, 122a, 122b1, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

143 (c2). Other accidents of pregnancy.

The following nonpuerperal causes are preferred.—1 to 28 inc., 29 [13], 30 to 38 inc., 40, 41 [16], 42a, 43 to 52 inc., 54, 55, 57, 58b1, 59 to 68 inc., 69a, 70 to 73 inc., 74a1, 74b, 75, 76, 77 [17], 78, 83, 84, 86, 87, 88a [17a], 88b, 89, 90a and b, 91, 92 [15], 93 [18], 94, 97a1, 97b, 98a, 99 to 102 inc., 104 to 106 inc., 107a and b, 107c1, 108, 109b, 110, 111, 112a, 114a, 116a1, 116c1, 117, 118, 119a and b, 119c [19], 120 to 123 inc., 124a, b, and c, 125, 129a, 130, 131a [20], 132, 134, 137, 139, 151a, 151b [21], 152, 153a [22], 153b [19], 154a, 155, 156a, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

144. Puerperal hemorrhage.

The following nonpuerperal causes are preferred.—1, 2, 6, 8, 10, 14, 17, 18, 20, 21 [12], 22, 24, 25c1, 26 to 28 inc., 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 43 to 49 inc., 54, 55, 60b1, 63, 65, 72, 76, 91a, 91c1, 111a1, 111b1, 112a, 116a1, 116c1, 120, 121, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

145 (a). Cesarean section.

The following nonpuerperal causes are preferred.—1, 2, 6, 8, 10, 14, 17, 18, 20, 21 [12], 22 to 24 inc., 25c1, 26 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 43 to 49 inc., 54, 55, 60b1, 63, 65, 72, 76, 91a, 91c1, 111a1, 111b1, 112a, 116a1, 116c1, 120, 121, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

145(b). Other surgical operations and instrumental delivery.

The following nonpuerperal causes are preferred.—1, 2, 6, 8, 10, 14, 17, 18, 20, 21 [12], 22 to 24 inc., 25c1, 26 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 43 to 49 inc., 54, 55, 60b1, 63, 65, 67a, 67b1, 68a, 72, 76, 91a, 91c1, 111a1, 111b1, 112a, 116a1, 116c1, 120, 121, 129a, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

145 (c1). Other accidents of labor.

The following nonpuerperal causes are preferred.—1, 2, 6, 8, 10, 14, 17, 18, 20, 21 [12], 22, 24, 25c1, 26 to 28 inc., 29 [13], 30a, 31 to 35 inc., 37a, 38, 43 to 49 inc., 54, 55, 72, 76, 111a1, 111b1, 112a, 116a1, 116c1, 120, 121, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

145 (c2). Other accidents of labor.

The following nonpuerperal causes are preferred.—1, 2, 6, 8, 10, 14, 17, 18, 20, 21 [12], 22 to 24 inc., 25c1, 26 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 43 to 49 inc., 54, 55, 60b1, 63, 65, 67a, 67b1, 68a, 72, 76, 91a, 91c1, 111a1, 111b1, 112a, 116a1, 116c1, 120, 121, 129a, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

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[12] Assign to 146 unless erysipelas is known to have preceded delivery.
[13] Assign to 148.
[14] Gonococcic peritonitis and gonococcic salpingitis assign to 146.
[15] Assign to 147.
[16] Assign to 146 unless the septic condition is known to have been independent of the puerperal condition.
[17] Pregnancy with dementia assign to 149.
[17a] Assign to 146.
[18] 93—pyemic phlebitis, pyophlebitis, septic phlebitis, septic thrombo phlebitis, suppurative phlebitis, with titles 143a to 150, assign to 146. All other terms under this title with 143a, 143c1, 143c2, 145c3, 149, and 150, assign to 147.
[19] In combination with certain forms of abscess assign to 146.
[20] Assign to 148 unless kidney complication is known to have preceded pregnancy.
[21] 151b in combination with certain gangrenous infections assign to 146.
[22] 153a in combination with abscess of iliac region or retroperitoneal abscess assign to 146.

145 (c3). Other accidents of labor.

The following nonpuerperal causes are preferred.—1 to 10 inc., 12 to 14 inc., 16b, 17 to 20 inc., 21 [12], 22 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 42a, 43 to 49 inc., 54, 55, 57, 59, 60b1, 63, 65, 67a, 67b1, 68a, 72, 73a, 76, 84a, 90a, 91a, 91c1, 92 [15], 110a, 111a1, 111b1, 112a, 116a1, 116c1, 117a, 118a1, 118b1, 120, 121, 122a, 122b1, 129a, 130, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

146. Puerperal septicemia.

The following nonpuerperal causes are preferred.—1, 2, 6, 8, 10, 14, 17, 18, 20, 22, 24, 25c1, 26 to 28 inc., 38, 43 to 49 inc., 72, 76, 116a1, 116c1, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

147. Puerperal phlegmasia alba dolens, embolus, sudden death.

The following nonpuerperal causes are preferred.—1, 2, 6, 8, 10, 14, 17, 18, 20, 21 [12], 22 to 24 inc., 25c1, 26 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 43 to 49 inc., 54, 55, 60b1, 63, 65, 72, 76, 91a, 91c1, 111a1, 111b1, 112a, 116a1, 116c1, 120, 121, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

148. Puerperal albuminuria and convulsions.

The following nonpuerperal causes are preferred.—1, 2, 6, 8, 10, 14, 17, 18, 20, 21 [12], 22 to 24 inc., 25c1, 26 to 28 inc., 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 43 to 49 inc., 54, 55, 60b1, 63, 65, 72, 76, 91a, 91c1, 111a1, 111b1, 112a, 116a1, 116c1, 120, 121, 129a, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

149. Following childbirth (not otherwise defined).

The following nonpuerperal causes are preferred.—1, 2, 5 to 14 inc., 16 to 20 inc., 21 [12], 22 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 42a, 43 to 49 inc., 54, 55, 57, 59, 60b1, 63, 65, 67a, 67b1, 68a, 72, 73a, 76, 84a, 90a, 91a, 91c1, 92 [15], 111a1, 111b1, 112a, 116a1, 116c1, 117a, 118a1, 118b1, 120, 121, 122a, 122b1, 129a, 130, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

150. Puerperal diseases of the breast.

The following nonpuerperal causes are preferred.—1 to 14 inc., 16 to 20 inc., 22 to 28 inc., 29 [13], 30a, 31 to 35 inc., 36a and b, 36c1, 36d and e, 37, 38, 42a, 43 to 49 inc., 50a, 51, 54, 55, 57, 58a, 58b1, 59, 60a, 60b1, 63 to 65 inc., 67, 68, 69a, 71b, 72, 73, 74a1, 74b, 75, 76, 83, 84a and b, 86b, 87, 89, 90a, b, and c, 91, 92 [15], 107b, 111, 112a, 116a1, 116c1, 117, 118, 119a, 120, 121, 122a, 122b1, 125, 129a and b, 130, 132, 134b1, 140, 151a [23], 151b [21], 155a, 165 to 191 inc., 193 to 199 inc., 201a, 202, 203.

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[12] Assign to 146 unless erysipelas is known to have preceded delivery.
[13] Assign to 148.
[15] Assign to 147.
[21] 151b in combination with certain gangrenous infections assign to 146.
[23] Assign to 146 which takes preference.

APPENDIX B.—COMPLETENESS OF BIRTH REGISTRATION

Information supplied by State registrars of vital statistics on the subject of the completeness of birth registration is summarized for States in the birth-registration area in 1919 as follows. In many States effective and ingenious methods of checking birth registration are in use which the following brief quotations do not adequately describe:

Connecticut.—"We estimate the proportion of births registered to be about 95 per cent plus. * * * I am of the opinion that birth registration has been improved in the last few years, due largely to the fact that we send each mother a complimentary birth certificate."

District of Columbia.—"Between 95 and 96 per cent of the births in 1919 registered."

Indiana.—Test made by the United States Census Bureau in 1922; "about 92 per cent" of the births are registered.

Kansas.—"No check of birth registration in Kansas in last few years. I estimate * * * very near 99 per cent at the present time. I am sure there has been an improvement in the last few years."

Kentucky.—"We are receiving in this department between 90 and 95 per cent of all births occurring in the State. * * * A check of stillbirths and infant death certificates against birth certificates is made at stated times—usually once or twice a year."

Maine.—"Between 98 and 99 per cent of all births registered."

Maryland.—Test made by the Bureau of the Census by checking infant deaths against birth certificates in 1917 indicated registration 94 per cent complete. "Since then we have conducted no test to ascertain the completeness of birth registration. I am satisfied that it is better now than it was in 1917."

Massachusetts.—"In the majority of cities and towns a canvass is made in January each year, and from results of this canvass it would appear that less than one-half of 1 per cent of the births are unrecorded."

Michigan.—Official check made by Bureau of the Census in 1921. Unofficially informed that it showed about 94 per cent complete.

Minnesota.—A test made by the Bureau of the Census in 1921 showed 94.5 per cent of the births registered. Now "at least 96 per cent (and probably more) of our births are registered."

New Hampshire.—"Whenever a death record of an infant under 1 year of age is reported, we always check up with the births and almost always find the birth record. * * * We now believe that less than 1 per cent are not reported."

New York (exclusive of New York City).—Test made in January, 1923, by checking deaths of infants under 1 year against birth certificates indicated 97.4 per cent registered. "Birth registration to-day is nearly perfect; possibly the only unrecorded births are those occurring in isolated districts and in foreign families where no attendant was present. * * * The birth rate in 1919 was at least 95 per cent perfect and in all probability was higher."

New York City.—"We can safely say that our present registration of births is well over 99 per cent of total number born."

North Carolina.—"We have never tested our birth registration for the year 1919. We have always felt that we were getting nearly all births reported."

Ohio.—Test made by Bureau of the Census of birth registration in 29 counties of Ohio in October and November, 1923, indicated birth registration 92.1 per cent complete.

Oregon.—A test made in 1919 indicated birth registration about 93 per cent complete.

Rhode Island.—"Estimating the proportion of births now registered in this State, it would be safe to say that only a very small proportion are among the unregistered. I feel sure that this work has improved wonderfully since the middle of 1921."

South Carolina.—A test in 1919 made by the United States Census Bureau indicated registration over 90 per cent complete. Test for 1923 showed only about 82 per cent. "For the year 1924, owing to extra effort on the part of this office, we are approximately 1,500 births ahead of last year for the first four months."

Utah.—No test made for 1919. The test made by the United States Bureau of the Census in June, 1924, "found approximately 97 per cent registration. In my opinion this is not far from correct."

Vermont.—No test made for 1919. "I feel that our birth registration is well over 90 per cent; in fact, I should put it at 95 or better."

Virginia.—The test made by the United States Bureau of the Census in 1917 indicated "over 92 per cent of registration." "We are getting at least 95 per cent, possibly more."

Washington.—"About 96 per cent complete."

Wisconsin.—Test of birth registration in January and February, 1923, made by checking deaths of infants under 1 year of age against the birth certificates showed 93 per cent registered.

APPENDIX C.—REGISTRATION AND DEFINITION OF STILLBIRTHS

PART I.—UNITED STATES

In order to obtain the most accurate measure of maternal mortality the deaths should be compared with the number of confinements or the number of live and still births less the extra twins and triplets; it is important, therefore, to consider the subject of the registration of stillbirths. But if accurate maternal mortality rates are to be based upon the number of confinements, not only must the stillbirths as well as the live births be uniformly registered in the several States, but they must be uniformly defined. In the United States there is neither a uniform requirement for registering stillbirths, nor is there a uniform definition.

Requirement of registration.—In 37 States the law requires stillbirths to be registered both as births and as deaths. Eight other States require registration of stillbirths as births and deaths under regulations of the State board of health or of public welfare. This double requirement provides for securing the information called for on the death certificate, including cause, if known, as well as the details called for on the birth certificate. Since in most States death certificates for stillbirths must be attested by a physician, or, in case no physician was in attendance, must be certified by a coroner or other officer authorized by law, before a burial permit can be obtained, the double requirement of registration of stillbirths as births and as deaths tends to insure more complete registration.

In Illinois, New Jersey, and the District of Columbia stillbirths must be registered as such upon a special form provided for the purpose. Connecticut has no provision for registration of stillbirths. [1]

A complete tabulation of stillbirths is possible only by matching the birth and death certificates for the same stillbirths, for only in this way will all the data be made available. In practice, the registration of stillbirths as deaths is usually slightly better than the registration of stillbirths as births. In a few cases a stillbirth may be registered as a birth but not as a death.

Definition.—The so-called "model law" for the registration of births and deaths reads in part as follows: "A stillborn child shall be registered as a birth and also as a death, * * * *Provided*, that a certificate of birth and a certificate of death shall not be required for a child that has not advanced to the fifth month of uterogestation."

In 16 States the law providing for the registration of stillbirths as births and deaths defines stillbirths as suggested in the model law. In 6 States the same period of uterogestation for stillbirths is adopted by regulation of State boards of health or of public welfare, and in 1 State instructions issued by the State registrar require to be reported stillbirths that have advanced to the fifth month. In other States various periods of uterogestation have been adopted as a requirement for reporting births either by law or regulation, or, in some instances, as a matter of practice. The method of reporting these births and the period of uterogestation are shown in the accompanying chart.

[1] Gen. Stat. 1918, sec. 329, amended by Public Acts of 1919, ch. 56, requires the registration of the birth of "any child." The Connecticut Department of Health states, "There is nothing whatsoever in the statutes relating to the registration of stillbirths. However, this department has for some time distributed blanks for the registration of stillbirths."

Summary of regulations regarding the registration and definition of stillbirths in the United States in force December, 1924

State	Reported as births and deaths	Reported as stillbirths	Period of uterogestation— Defined by law	Defined by regulation	Defined by instructions to physicians or otherwise
Alabama	Yes		Advanced to fifth month.		
Arizona	Yes		do		
Arkansas	Yes [1]			Advanced to fifth month.	
California	Yes		Advanced to fifth month.		
Colorado	Yes				Custom by common consent to report after sixth month.
Connecticut [2]					
Delaware	Yes				
District of Columbia.		Yes	Passed fifth month		
Florida	Yes		Advanced to fifth month.		
Georgia	Yes		do		
Idaho	Yes				Practice to report as stillbirth from 3 months.
Illinois		Yes	Advanced to fifth month.		
Indiana	Yes		Seventh month and over.		
Iowa	Yes		Advanced to fifth month.		
Kansas	Yes [1]			Passed the twenty-eighth week.	
Kentucky	Yes				Pretty generally understood that births occurring after 4½ months are to be reported.
Louisiana	Yes		Advanced to fifth month.		
Maine	Yes				Five months and over, by order of State commissioner of health.
Maryland	Yes				Any product of human gestation which can be recognized as such which after birth * * * does not breathe.
Massachusetts	Yes		[3]		
Michigan	Yes [1]			Over 6 months	
Minnesota	Yes		Advanced to fifth month.		
Mississippi	Yes [1]			Advanced to fifth month.	
Missouri	Yes				In addition to filing of stillbirths, all abortions shall likewise be filed regardless of period of uterine gestation.
Montana	Yes			Passed fourth month or sixteenth week.	
Nebraska	Yes		Advanced to fifth month.		
Nevada	Yes				No provision by State board of health "but is generally understood to have passed the period of quickening."
New Hampshire	Yes				
New Jersey		Yes			After fifth month (instructions to physicians).

[1] Regulation State board of health

[2] See note 1, p. 114.

[3] The State department of public health states, "The word (stillborn) is nowhere in our laws defined or explained. Moreover, we have found that even individual hospitals have established their own standard as have several of the boards of health of the larger cities. The standard we have set for our own use is that a stillbirth is the birth of the fetus of 6 months' development or over.

Summary of regulations regarding the registration and definition of stillbirths in the United States in force December, 1924—Continued

State	Reported as births and deaths	Reported as still-births	Period of uterogestation—		
			Defined by law	Defined by regulation	Defined by instructions to physicians or otherwise
New Mexico	Yes [4]			Advanced to fifth month.	
New York	Yes [5]		Advanced to fifth month.		
North Carolina	Yes		do		
North Dakota	Yes				
Ohio	Yes				
Oklahoma	Yes		Advanced to fifth month.		
Oregon	Yes		do		
Pennsylvania	Yes				Passed fourth month (rule of State department of health).
Rhode Island	Yes			After sixth month.	
South Carolina	Yes [1]			Advanced to fifth month.	
South Dakota	Yes [1]			do	
Tennessee	Yes		Advanced to fifth month.		
Texas	Yes		After 7 months		
Utah	Yes				6 months and over.
Vermont	Yes				
Virginia	Yes				Advanced to fifth month (instruction of State registrar).
Washington	Yes		Beyond seventh month.		
West Virginia	Yes		Advanced to fifth month or to total length of 10 inches.		
Wisconsin	Yes				After fifth month (instructions to physicians and others).
Wyoming	Yes [1]			Advanced to fifth month.	

[1] Regulation State board of health.
[4] State board of public welfare.
[5] The State commissioner of health may furnish a combined certificate of birth and death and require it to be used instead of separate certificates.

The rules of statistical practice regarding stillbirths adopted by the American Public Health Association include the following definitions:

"Rule No. 17.—For registration purposes, stillbirths should include all children born who do not live any time whatever, no matter how brief, after birth.

"Rule No. 18.—Birth (completion of birth) is the instant complete separation of the entire body (not body in the restricted sense of trunk, but the entire organism, including head, trunk, and limbs) of the child from the body of the mother. The umbilical cord need not be cut or the placenta detached in order to constitute complete birth for registration purposes. A child dead or dying a moment before the instant of birth is a stillbirth, and one dying a moment, no matter how brief, after birth, was a living child, and should not be registered as a stillbirth.

"Rule No. 19.—No child that shows any evidence of life after birth should be registered as a stillbirth.

"Rule No. 20.—Stillbirths should not be included in tables of births or in tables of deaths. They should be given in separate tables of stillbirths.

"Rule No. 21.—It is not desirable that midwives be allowed to sign certificates of stillbirths." [2]

[2] Rules of Statistical Practice, adopted by the American Public Health Association, section on Vital Statistics, at the annual meeting, Winnepeg, Manitoba, August 25–28, 1908.

PART II.—FOREIGN COUNTRIES

Summary of regulations regarding the registration and definition of stillbirths in certain foreign countries [1]

Country	Registration compulsory [2]	Registered as births and deaths	Registered as births or deaths	In separate register	Period of uterogestation
Australia	No. [3]				
Belgium	Yes [4]			Yes	Subsequent to sixth month of pregnancy.
Chile	Yes			Yes	Over 6 months.
Denmark	No [5]		As birth		
England and Wales	No [6]				
Finland	Yes			Yes	After 6 months.
France	Yes [7]		As death		If sex can be determined.
Germany	Yes		do		
Hungary	Yes		As birth		After 7 months' gestation.
Ireland	No				
Italy	Yes [8]		As birth		
Japan	Yes			Yes	After 4 months.
The Netherlands	Yes [9]			Yes	
New Zealand	Yes [10]		As birth		At least 28 weeks.
Norway	Yes			Yes	
Spain	No [11]				
Sweden	Yes		As birth		
Scotland	No				
Switzerland	Yes [12]	Yes			After 6 months.
Uruguay	Yes		As death		

[1] Sources:

Infantile Mortality. Report of the special committee appointed by the Council of the Royal Statistical Society to inquire into the systems adopted in different countries for the registration of births (including stillbirths) and deaths with reference to infantile mortality, pp. 10, 12, 36, 47. London, 1912.

Annuaire International de Statistique; renseignements sur l'organisation actuelle des statistiques de l'état civil dans divers pays. Annexe aux Tomes I-V, pp. 14ff. La Haye, 1921. (Ibid., 1917, vol. 2, P. VII, for Finland).

The Official Vital Statistics of the Kingdom of Belgium, League of Nations Health Organization Statistical Handbook Series No. 2, Geneva, 1924.

Newsholme, Sir Arthur: The Elements of Vital Statistics, p. 77. London, 1923.

New Zealand, Statutes 1915, No. 56, sec. 4.

Movimiento de la Población, Chile, 1904, P. XI.

[2] "Where the registration of stillbirths is in force it is, with comparatively few exceptions, required under the general law relating to the registration of births, such laws having been drafted in general terms (i. e., they require the registration of all births, or the birth of every child, and not merely the birth of every living child, as in England). It is noteworthy that so far as can be ascertained no legislature has, up to the present, enacted any definition of stillbirth, and that the only guidance afforded to those required to declare and inscribe such births is that afforded by regulations made by the various statistical offices." Infantile Mortality. Report of the special committee * * * of the Royal Statistical Society, p. 10.

[3] In Victoria they are "reported" to local registrars who forward totals without particulars to the central office. Registration of stillbirths is required in Western Australia; for the purposes of registration a stillborn child is deemed to have been born alive and to have died.

[4] As stillbirths are considered: (1) Children born dead; (2) children born alive but dying before registration, i. e., within three days of birth.

[5] Although not prescribed by law the registration of stillbirths is generally recognized as compulsory and is in practice almost universal. Every fetus coming alive into the world is counted as a live birth, no matter what the duration of gestation may have been; and every fetus coming into the world without any signs of life during or after the twenty-ninth week of pregnancy is counted as a stillbirth. An embryo expelled (dead) before the twenty-ninth week is reckoned as an abortion.

[6] In Great Britain there is no official registration of stillbirths, but under the notification of births act the birth of any child "which has issued forth from its mother after the expiration of the twenty-eighth week of pregnancy, whether alive or dead," is required to be notified to the medical officer of health.

The rule of the Central Midwives Board, England, prescribes that an infant is to be regarded as stillborn if after complete birth it "has not breathed or shown signs of life," and this is the definition generally adopted in that country and used for registration purposes. The notification of stillbirths under the act of Parliament is limited as stated above; but midwives are required by the Central Midwives Board to notify stillbirths without any defined limitation to ages over the twenty-eighth week.

[7] Strictly according to the law it should be registered as birth and death, but the general practice is to enter the case as death only. The General Register Office counts as stillborn all children issuing from the mother's womb without manifesting any sign of life and those who, born with signs of life, die before registration of birth. (As three days are allowed for registration a certain number of children born alive appear in the registers as stillborn.)

[8] Infants dying in utero or during birth are deemed to have been born dead; all other, born alive. A child born alive but dying before registration of birth is, at law, stillborn but for statistical purposes is counted as "live birth."

[9] Stillbirths ("levenloos aangegeven") include any of the following: (a) Children born prematurely and dead; (b) full-term children born without life; and (c) children born alive but dying before registration of birth (for which three days are allowed). Since 1917 special tabulations have been made of those born alive but dying before registration.

[10] White births only.

[11] Registration is not required, but burial permit is necessary. Stillborn children include those born without signs of life and those born alive but dying within the first 24 hours after birth.

[12] A stillborn child is one dead before birth or dying during birth. Any child which has breathed after separation from the mother is held to have been born alive.

APPENDIX D.—STATISTICAL COMPARABILITY OF MATERNAL MORTALITY RATES IN THE UNITED STATES AND CERTAIN FOREIGN COUNTRIES

In attempting to compare maternal mortality rates for different countries it is necessary to consider whether and to what degree the figures are statistically comparable. Exact statistical comparability would be secured, of course, if each rate were accurate and if the causes or the groups of causes had the same or equivalent definitions. Following the lines of the discussion for the United States, the points to be considered are: (1) Uniformity or equivalence of definitions of puerperal causes with respect to accuracy of rates; (2) completeness of death registration; (3) accuracy of certification; (4) rules for classification of causes of death; and (5) completeness of birth registration. Each of these points will be discussed briefly.

UNIFORMITY OF DEFINITIONS OF PUERPERAL CAUSES

The "puerperal causes" as a group and also the subgroups of "puerperal septicemia" and of "all other puerperal causes," may be considered comparable as to definition.[1] Many of the countries for which statistics are presented use the International List of Causes of Death in which each rubric is defined in corresponding terms in the different languages. Certain of the countries which use this list and the years when its use was adopted—that is, the first year for which causes of death were classified according to the list—are: The United States (1900),[2] England and Wales (1911),[3] Scotland (1911),[3] Ireland (1911),[3] Australia (1907),[4] France (1901),[5] The Netherlands (1901),[6] New Zealand (1908),[7] Spain (1900),[8] Uruguay (1901),[6] and Chile (1903).[9] In other countries other lists of causes are in use; in each of these lists though puerperal septicemia and "other puerperal causes" are shown separately, when taken together they correspond to the group "all puerperal causes" of the International List.

COMPLETENESS OF DEATH REGISTRATION

Death registration is required by law in each of these countries, and in most of them, if not in all, the method of enforcement is similar to that in use in the United States, namely, the requirement that a death certificate be filed as a prerequisite to obtaining a burial permit.[10] In most of these countries registration of deaths has been in force for a much longer period,[11] and the density of population, or the proportion living in cities, is higher than in the United States; it would be expected, therefore, that death registration would be relatively more complete than in the United States.[12]

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[1] Annuaire International de Statistique: Europe, Mouvement de la population, pp. 168–179; Amerique, Mouvement de la population, pp. 103–120.

[2] Mortality Statistics, 1900–1904, P. X. Special Reports, U. S. Bureau of the Census.

[3] Annuaire International de Statistique: Europe, Mouvement de la population, p. 174.

[4] Official Year Book of the Commonwealth of Australia, No. 12, 1919, p. 187.

[5] Statistique Sanitaire de la France, 1909, Vol. 24, p. 143. Published by Direction de l'Assistance et de l'Hygiène publiques.

[6] Statistique Internationale du Mouvement de la Population, 1901–1910, p. 146. Published by Direction du Travail, Paris.

[7] The New Zealand Official Year-Book, 1919, p. 166.

[8] Statistique Internationale du Mouvement du la Population, 1907, pp. 577–598. Published by Direction du Travail, Paris.

[9] Oficina Central de Estadística, Población calculada de la Republica de Chile en 1910 i Reseña del Movimiento de Población del mismo año, p. 50. Santiago de Chile, 1912.

[10] See on this point Infantile Mortality. Report of the special committee of the Royal Statistical Society, pp. 25–35.

[11] Ibid, pp. 20–25. Compare accompanying list giving dates from which annual statistics of births and deaths are available.

[12] Ibid., pp. 26–33; replies from the different countries (1912) to the question "Do many births or deaths escape registration?"

Dates from which annual statistics of births and deaths are available in certain countries

EUROPE:	
Alsace Lorraine	1841
Austria	1819 (Nov. 1)
Baden	1817
Bavaria	1825–26 (Oct. 1)
Belgium	1830
Bulgaria	1881
Denmark	1801
England and Wales	1838
Finland	1751
France	1801
German Empire	1841
Greece	1864
Hamburg	1849
Hesse	1841
Hungary	1876
Ireland	1864
Italy	1863
The Netherlands	1839
Norway	1801
Portugal	1886
Prussia	1816
Rumania	1859
Russia (Europe)	1867
EUROPE—Continued.	
Saxony	1827
Scotland	1851
Serbia	1862
Spain	1858
Sweden	1749
Switzerland	1870
Wurttemburg	1841
AUSTRALASIA:	
New South Wales	1860
New Zealand	1861
Queensland	1860
South Australia	1861
Tasmania	1861
Victoria	1854
Western Australia	1861
ASIA:	
Japan	1872
CENTRAL AND SOUTH AMERICA:	
Argentina	1899
Chile	1880
Mexico	1895
Uruguay	1878

ACCURACY OF CERTIFICATION OF CAUSE OF DEATH

Upon the question of comparative accuracy of certification of the cause of death it is relatively difficult to adduce satisfactory evidence. Nevertheless, light can be thrown upon this subject by a consideration of the proportion of deaths certified by physicians, the proportion of deaths certified as due to ill-defined or unknown causes, the means by which the accuracy of certification is checked, and the evidence of possible transfers of puerperal to nonpuerperal causes. Indirect evidence is also furnished by the proportion of physicians to population and their average qualifications. (See pp. 79–80, 148.)

The first question to be examined is what proportion of deaths are certified by physicians. Evidence on this point is presented in the following table for the countries and the latest years for which the data could be obtained:[13]

[13] See p.10 for results of a special study of death certificates in selected States in the United States.

Proportion of deaths certified by physicians in certain foreign countries

Country	Year	Per cent of deaths with physician's statement of cause	Country	Year	Per cent of deaths with physician's statement of cause
Australia	1921	[1] 89.4	Hungary	1913	[8] 56.7
Austria (new boundaries)	1920	[2] 97.6	Ireland	1920	[9] 77.8
Chile	1921	[3] 25.0	Italy	1916	[2] 99.4
England and Wales	1920	[4] 92.1	The Netherlands	1921	[10] 96.5
Germany:			Norway	1917	[11] 88.9
Baden	1892–1901	[6] 70.3	Scotland	1921	[12] 98.9
Bavaria	1901–1902	[5] 64.8	Sweden	1916	[13] 65.6
Hesse	1898	[6] 87.0	Switzerland	1920	[14] 97.9
Saxony	1906	[7] 66.0			
Wurttemberg	1899–1900	[5] 62.8			

[1] "Certified by medical practitioners." An additional 10.3 per cent were certified by coroners or by magisterial inquiries; 0.3 per cent were not certified. Official Year Book of the Commonwealth of Australia, No. 15, pp. 125–126. Melbourne, 1922.

[2] Certified either by the medical attendant or by medical examiner. From Statistisches Jahrbuch für das deutsche Reich, 1921–22, pp. 10*–11*. See also: Handbuch der Medizinischen Statistik by F. Prinzing, p. 327. Jena, 1906.

[3] Compiled from Anuario Estadístico de la República de Chile, Vol. I, Demografía, Año 1921, p. 69.

[4] Certified by registered medical practitioners. In addition to these, 6.65 per cent were certified by (non-medical) coroners after inquest, leaving 1.2 per cent uncertified. Eighty-third Annual Report of the Registrar-General for England and Wales, 1920, p. xcvi.

[5] Per cent of deaths of persons attended by physicians before death. Prinzing, F.: Handbuch der Medizinischen Statistik, p. 325.

[6] Ibid., p. 325. Per cent of deaths certified (bestätigt) by physicians.

[7] "Certified by physicians." Quoted in "On the alleged increase of cancer," by Walter Francis Willcox, in The Journal of Cancer Research, Vol. II, (1917), p. 299.

[8] Per cent of causes "diagnosed (festgestellt) by physicians." Compiled from Ungarisches Statistisches Jahrbuch, Neue Folge, XXI, 1913, pp. 47–49.

[9] "Certified by medical practitioners." Fifty-seventh Annual Report of the Registrar-General for Ireland, 1920, p. xv. Cmd. 1532. Of deaths of persons from 1 to 64 years of age, inclusive, 90.8 per cent were certified. Ibid., pp. xv, xvi.

[10] Per cent of deaths with medical attendance. Deaths from violence and suicide are included with those without medical attendance. Compiled from Statistiek van de sterfte naar den Leeftijd en de Oorzaken van den Dood over het jaar, 1921, pp. liv. and lv.

[11] Per cent of deaths certified by physicians. Deaths from unknown causes returned by physicians, deaths from violence and suicide, are included among those not certified as to cause by physicians. Sundhetstilstanden og medisinalforholdene, 1917, Norge Offisielle Statistikk VII, 3, p. 33.

[12] Certified either by registered medical practitioner or by a procurator fiscal (coroner). Sixty-seventh Annual Report of the Registrar-General for Scotland, 1921, p. xiv. Edinburgh, 1922.

[13] Certified by physicians. Statistisches Jahrbuch für das deutsche Reich, 1921–22, pp. 10*–13*.

[14] Certified (bescheinigt) by physicians. Compiled from Annuaire Statistique de la Suisse, 1912, pp. 13, 27.

France, Prussia, and New Zealand also provide spaces on the individual death certificate for an answer to the question: "Was the cause certified by a physician?" [14] In New Zealand, where the physician in attendance is required by law [15] to certify to the cause of death, it is probable that a very large proportion of deaths are so certified. In Prussia physicians in attendance may be required by local ordinance to certify as to causes of death.[16]

Though the proportion of all cases in which the cause of death was certified by a physician throws a clear light upon the value of the statistics, for the present purpose it would be more useful to know the proportion in which the causes of deaths of women of childbearing ages were thus certified. These figures are available for only a few countries. They indicate that for this group of women of childbearing ages the causes of death are certified by physicians in much larger proportions than for other age and sex groups. Thus, in the Netherlands, the proportion of deaths without medical attendance was 3.5 per cent for all ages and both sexes; it was only 1.3 per cent for women from 15 to 19, 1.7 per cent for women from 20 to 29, 1.2 per cent for women from 30 to 39, and 1.9 per cent for women from 40 to 49 years of age.[17]

[14] Annuaire International de Statistique; Renseignements sur l'organisation actuelle des statistiques de l'état civil dans divers pays. Annexe aux Tomes I–V (Partie Demographie), pp. 16–17. La Haye, 1921.

[15] Consolidated Statutes, Births and Deaths Registration Act, 1908, No. 16, sec. 24 ff.

[16] Prinzing, F.: Handbuch der Medizinischen Statistik, pp. 320–324.

[17] Statistiek van de Sterfte naar den Leeftijd en de Oorzaken van den Dood over het jaar 1921. Statistiek van Nederland No. 362, p. lv. The physician in attendance is required by law to certify the cause of death. Prinzing, F.: Handbuch der Medizinischen Statistik, p. 320.

Furthermore, although a distinction between several puerperal causes would be correctly drawn only by a properly qualified physician who had been in attendance, in case of a death connected with childbirth a statement of the cause by a medical examiner who had not been in attendance, or even by a layman, would doubtless result in the great majority of cases in a correct assignment to the group of puerperal causes. In most cases the fact of childbirth would be quite as well known to the members of the family as to the physicians in attendance, and if a death occurred at the time of, or soon after, childbirth that fact would be likely to be regarded even by a layman as a factor in, if not the cause of, the death.[18]

A second criterion of the accuracy of certification might be found in the proportion of deaths from ill-defined or unknown causes. But unfortunately, no comparison can be made of the proportions of cases assigned to these causes because of the great divergence between the various countries in the practice of classifying such deaths. In Switzerland, for example, all causes which are not certified by physicians are classed as ill-defined or unknown.[19] In the classification in use in England and Wales up to 1911 all deaths certified as due to old age or senility were included with those from unknown causes;[20] deaths the causes of which were certified in accordance with inquest findings by nonmedical coroners were classified, like those certified by physicians, according to the causes assigned. In short, such are the variations in practice in the different countries that no significant conclusion as to the comparative value of the certification of causes could be drawn solely from a consideration of the proportion of cases assigned to ill-defined or unknown causes.

A third criterion of the value of the certification of cause is found in the procedure taken to reduce the number of unsatisfactory reports. The practice of the United States Bureau of the Census, beginning in 1911, of sending letters of inquiry to physicians in regard to the true causes of all deaths reported in unsatisfactory or indefinite terms has already been discussed (pp. 11–12). In England and Wales this practice of querying doubtful causes, commenced by the Registrar-General in 1881, [21] has resulted in the addition of considerable numbers of deaths due to puerperal causes. (See Gen. Table 9, p. 149.) According to Prinzing a like method has been used in Prussia since 1901.[22] A different procedure and one calculated to secure even better results is followed in Switzerland. In that country the physician in attendance, in addition to filling in the certificate of cause for the local registrar, sends directly to the central statistical office a secret statement of the true cause; this latter report is used only for statistical purposes. This practice was introduced in 1891 in cities with more than 10,000 inhabitants and was extended in 1893 to all communes with more than 5,000 population and in 1901 to the entire country.[23] The same system has been adopted in certain German cities.[24]

Finally, a fourth criterion of the accuracy of certification may be sought in the evidence relating to possible transfers of deaths from puerperal to other causes.[25] The results of a test showing the number of puerperal deaths in comparison with the estimated excess of female over male deaths from peritonitis, acute nephritis, septicemia and convulsions (unqualified), and Bright's disease for countries for which the detailed statistics necessary for the computation were available have been presented and discussed earlier in the report. (See pp. 58–59).

In addition to transfers of puerperal deaths to these particular causes transfers may have been made to others, such as salpingitis, to which this method of estimate is inapplicable. Furthermore, in certain countries—for example, Chile and Hungary—in which a large proportion of the deaths are certified by

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[18] In 1913 in Hungary 56.7 per cent of all deaths were certified by physicians, and of the deaths assigned to puerperal causes 54.8 per cent were certified by physicians. The deaths certified by physicians were assigned to the two major divisions "puerperal fever" (Kindbettfieber) and diseases of childbirth (Geburtskrankheiten); those returned by persons other than physicians were classified under the terms, "puerperal fever" and "confinement" (Wochenbett). Compiled from Ungarisches Statistisches Jahrbuch, Neue Folge, XXI, 1913, pp. 47–49.

[19] Prinzing, F.: Handbuch der Medizinischen Statistik, p. 326.

[20] Eighty-third Annual Report of the Registrar-General for England and Wales, 1920, p. xciv.

[21] Supplement to the Fifty-fifth Annual Report of the Registrar-General of Births, Deaths, and Marriages in England, p. xxiii (C 7769), (London, 1895); Forty-fourth Annual Report of the Registrar-General, 1881, p. xx (3620), (London, 1883).

[22] Prinzing, F.: Handbuch der Medizinischen Statistik, p. 324. See also Statistisches Jahrbuch der Stadt Berlin, 32 Jahrgang, enthaltend die Statistik der Jahre 1908 bis 1911, sowie Teile von 1912, p. 143* (Prof. Dr. H. Silbergleit, Berlin, 1913).

[23] Prinzing, F.: Handbuch der Medizinischen Statistik, p. 321.

[24] Ibid., p. 322 (Berlin, since 1904); Kisskalt, Karl: Einführung in die Medizinalstatistik, p. 41 (Charlottenburg).

[25] Such evidence has been presented for the United States, pp. 13–14.

nonmedical persons, the causes of puerperal deaths may frequently have been reported in popular or in indefinite terms which might be classified in other groups than those that have been discussed. If so, in order to obtain an estimate of all the transfers from puerperal to other causes, the comparison of actual with expected female deaths would have to be applied to all the causes to which such transfers may have been made. On the other hand, if in those cases in which childbirth is a cause of death the layman simply states "childbirth" they may be correctly classified as puerperal, though not properly allocated to the particular puerperal-disease group to which they belong. The fact that in Chile the mortality from puerperal causes is exceptionally high suggests that many deaths returned by laymen are allocated to the puerperal group.[26]

Special investigations into the mortality from puerperal causes are few in number, and though they furnish perhaps the best type of evidence, they usually relate to small areas and are not up to date. Perhaps the best of these special investigations is that by Doctor Ehlers into the mortality from puerperal causes in Berlin during two years, 1895–96. By correspondence with physicians, study of hospital records, and personal investigation he discovered many puerperal deaths which had been returned as nonpuerperal. The net result of the investigation was to add 68.7 per cent to the total puerperal deaths (26.8 per cent to the deaths from puerperal septicemia) in that city in 1895–96.[27]

Since that date the system of a confidential return of cause of death (which is sent directly by the physician to the statistical office) has been introduced in Berlin. The statistical office in that city has adopted also the routine sending of letters of inquiry to the physician in cases of doubtful diagnoses. In 1910, for example, of the 250 cases of deaths from puerperal septicemia, 48 had been added as a result of the information secured by these letters of inquiry.[28]

RULES FOR CLASSIFICATION OF JOINT CAUSES OF DEATH

When two or more conditions are assigned as primary or contributory causes of death it is customary to select one for purposes of tabulation. In practice, the exact comparability of statistics relating to deaths from puerperal causes depends not only upon the diseases which are included together in the group but also upon the rules governing decisions as to whether a puerperal or a nonpuerperal cause shall be selected as the principal one for purposes of statistical analysis.

COUNTRIES USING INTERNATIONAL LIST OF CAUSES WITHOUT MODIFICATION

So far as the countries which use the International List of Causes of Death are concerned, the classification of deaths which are assigned to two or more causes is made in accordance with general rules adopted by the International Commission.[29] These rules are given in the French edition of 1903 as follows:

"(1) If one of the two diseases is an immediate and frequent complication of the other, the death should be classified under the head of the primary disease.

"(2) If the preceding rule is not applicable, the following should be used: If one of the diseases is surely fatal [30] and the other is of less gravity, the former should be selected as the cause of death. Example, 'Pulmonary tuberculosis and puerperal septicemia, classify as tuberculosis.'

"(3) If neither of the above rules is applicable, then the following: If one of the diseases is epidemic and the other is not, choose the epidemic disease.

"(4) If none of the three preceding rules is applicable, the following may be used: If one of the diseases is much more frequently fatal than the other, then it should be selected as the cause of death.

"(5) If none of the four preceding rules applies, then the following: If one of the diseases is of rapid development and the other is of slow development, the disease of rapid development should be taken.

"(6) If none of the above five rules applies, then the diagnosis should be selected that best characterizes the case.

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[26] In Chile in 1921 of the deaths from puerperal septicemia only 30.2 per cent, and of deaths from "other accidents of childbirth" 89.8 per cent were reported by laymen. Compiled from Anuario Estadístico de la República de Chile, Vol. I, Demografía, Año 1921, p. 68.

[27] Ehlers, Philipp, M. D.: Die Sterblichkeit "im Kindbett" in Berlin und in Preussen, 1877–1896, p. 30. Stuttgart, 1900.

[28] Statistisches Jahrbuch der Stadt Berlin, 32d Jahrgang, enthaltend die Statistik der Jahre 1908 bis 1911, sowie Teile von 1912, p. 143*. Prof. Dr. H. Silbergleit, Berlin, 1913.

[29] For rules in use in England and Wales see pp. 126–129; United States see pp. 107–111.

[30] Apart from all treatment. This provision is necessary to assure stability in the application of the rules. Otherwise a therapeutic discovery, for example that of the antidiphtheritic serum, would modify the tables and injure the comparability of the statistics.

"Precise diagnoses should be given the preference over vague and indeterminate terms, such as 'hemorrhage,' 'encephalitis,' etc. Arbitrary decisions should be avoided as much as possible by the use of the preceding rules. None of them is absolute, but all are subject to exceptions, which may vary according to local usages.[31] In practice the first rule, which is the most logical of all, is the one of most frequent application. The others have been formulated only to prepare for all cases and to treat them with system and uniformity." [32]

The decisions of the United States Bureau of the Census for carrying these rules into effect in particular cases are published, as already stated, in the Manual of Joint Causes of Death. (See pp. 107–111).

GERMANY

The rules for allocating joint causes adopted in Germany, one of the countries which uses a special list of causes, are as follows:

"1. The death is, as a rule, to be assigned to that number which represents the probable primary cause (Grundleiden). Only when the primary cause is not a real disease may it be disregarded.

"2. With two independent diseases, the more severe should be chosen.

"3. With an infectious disease and a noninfectious disease, the former should be chosen.

"4. If acute diseases are reported with chronic diseases, the acute diseases are to be preferred.

"5. If two infectious diseases are reported as causes of death, then smallpox, scarlet fever, measles, typhus fever, diphtheria and croup, whooping cough, croupous pneumonia, influenza, typhoid fever, paratyphoid fever, Weil's disease, relapsing fever, cerebrospinal fever, erysipelas, tetanus, septicemia, puerperal fever, plague, Asiatic cholera, dysentery, anthrax, glanders, rabies, and trichiniasis should have the preference over tuberculosis, malaria, or a venereal disease.

"6. Causes of death from violence are usually preferred.

"7. Such returns as heart weakness ('heart failure'), cardiac paralysis of the lungs, pulmonary edema, coma, and the like, should be disregarded if other causes are named.

"8. With tuberculosis of several organs, including that of lungs, tuberculosis of the lungs should be selected." [33]

SWEDEN

The rules used in Sweden for certifying and for classifying of joint causes of death are contained in a circular of the medical administration dated October 9, 1911, which gives the classification of causes of death together with an alphabetical list. The principal points in these instructions are as follows:

"3. The new nomenclature shall be used beginning with the year 1911, and in applying it the following rules shall be observed:

"(*a*) The nomenclature of causes of death (appendix 1) is principally designed for service to physicians and persons who have to tabulate the statistics and register the certificates of death, while for the terms to be used as causes of death, physicians who have to fill out death certificates are referred to the alphabetical list (appendix 2) and to the notes and remarks which apply no less to the nomenclature than to the list.

"(*b*) As principal cause of death is to be given the disease which, so far as can be determined, was the major disease. A complicating disease is to be designated as a contributory cause of death.

"Note 1.—Death from pneumonia complicating a case of typhoid fever, whooping cough, measles, influenza, etc., should accordingly be returned as typhoid fever, etc., with pneumonia as a contributory cause of death, even if at the end the last-mentioned disease was the outstanding one. A death from 'purulent peritonitis' following appendicitis or puerperal fever should be returned as appendicitis or puerperal fever with peritonitis as a contributory cause, etc.

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[31] The impropriety of certain expressions should be noted particularly. For example, if a physician writes typhoid fever, chronic nephritis, it is almost certain that he intended to indicate typhoid fever complicated with albuminuria and not a patient with Bright's disease attacked with typhoid fever. When a disease ordinarily rare or absent undergoes a large extension (e. g., cholera, yellow fever, etc.) the total deaths should be noted without any exception whatever. For such cases it is necessary to waive all ordinary rules.

[32] Manual of the International List of Causes of Death based on the Second Decennial Revision by the International Commission, Paris, July 1 to 3, 1909, pp. 17, 18.

[33] Ibid., pp. 18–19.

"Note 2.—If the deceased was suffering from two different independent diseases, the one which can be considered to have caused the death should be designated as the principal cause. If one is an acute infectious disease it should be preferred as a rule as the principal cause. Accordingly, if, for example, an insane person dies of typhoid fever, the latter as a rule should be given as the principal cause.

"(c) Physicians who fill out death certificates need note only the name of the principal and of the contributory cause of death; the list number is to be entered by the person who enters the death upon the register. In case there is any reason for concealment as in case of syphilis, suicide, etc., the principal cause of death may be entered by the person who fills out the death certificates by writing the list number of the disease in the nomenclature, as 33, 44, 99, etc.; in such a case if there is a contributory cause present it may be written out in full." [34]

An article by Gustav Hultquist, who assisted in deciding the various questions which arose in determining causes of death in the compilation of Swedish statistics for 1911, throws further light upon these rules and upon the procedure of the statistical office in classifying causes of death in Sweden.

"The instructions which the circular in question gives are few. However, certain conclusions can be reached as to what should be given in a death certificate as the principal cause of death, and in general how the certificate should be prepared. The most important of these instructions and conclusions are as follows:

"1. Only one principal cause of death is to be given, and the accepted nomenclature is to be followed as closely as possible. Contributory causes of death should be given as fully as the attending physician deems suitable.

* * * * * * *

"3. With malformations and diseases of the newborn 'diseases which occur in the first week of life' should be preferred.

"4. If pulmonary tuberculosis is given along with some other form of tuberculosis on the death certificate, the case is classified as pulmonary tuberculosis even if the latter is not given as the principal cause of death. If tuberculosis is found as the contributory cause in connection with some disease other than tuberculosis—for example, with diabetes—the death is classified as caused by the latter.

"5. An accidental death due to an epileptic attack is classified as epilepsy.

"6. If suicide is committed by a person suffering from mental disease (as previously diagnosed), the cause of death is classified as mental disease.

"7. Terms designated * in the alphabetical list may be given as principal causes of death only in case a fundamental disease can not be ascertained.

"Upon looking over the terms designated *, which number 130, one finds in general that it is a question of (1) symptoms, anatomical changes, and insufficiently defined diseases, such as cardiac asthma, convulsions, hematuria, hemiplegia, icterus, pulmonary edema, spasm of the glottis, degeneration of the heart, hydronephrosis, anemia, tumor, etc., or (2) diseases which usually complicate some other disease the designation of which in the alphabetical list is not preceded by *; as, for example, cholecystitis, mastoiditis, ostitis, peritonitis, thrombophlebitis. The great majority of diseases preceded by * belong to the latter group. In the filling out of a death certificate one can go back from the so-called medical causes of death through a whole list of terms designated *; for example, purulent meningitis*, cerebral abscess*, mastoiditis*, otitis media*. All these are marked with an *, and therefore one should follow the causal connections until one comes to the fundamental disease which does not have an *; for example, scarlet fever. If otitis is a complication following trauma, it belongs under violent death. It is only when a fundamental disease can not be determined that a term designated with * may be used.

"8. In case of the terms designated by ** it should if possible be stated whether death occurred as a result of accident or through murder or suicide. In a case of accident it should be stated whether the accident occurred during intoxication or as a result of an epileptic attack and in case of suicide whether the person was suffering from mental disease. In deaths due to accident, suicide, or murder the death certificate should contain, in addition to the above, specifications in accordance with Items XVIII, 98–100 in the nomenclature. In case of "crushing" accidents or fractures it should be stated whether the injury was due to railway accident or explosion, etc., and in case of poisoning the kind of poison.

[34] Kungl. Medicinalstyrelsens cirkulär till samtliga läkare i riket angående uppgifter om dödsorsaker; utfärdadt i Stockholm den 9 Oktober 1911. Bihang till Svensk Författnings-Samling, No. 58, pp. 1–2.

"9. If the place affected is a significant part of the cause and the localization does not appear from the name of the disease in the alphabetical list of causes of death, such as in case of abscess, carcinoma, fracture, hernia, etc., the localization of the disease should be given in the death certificate.

"10. All congenital malformations, with the exception of those given in the alphabetical list, should be designated 'Monstrum,' the physician who fills out the death certificate being responsible for stating in parenthesis, so far as possible, the particular type of malformation which is present.

"11. By comparing the alphabetical list for guidance in filling out death notices and the classification for use in tabulation of the data one can get some help in deciding in certain cases what causes should receive preference as the principal causes of death. The 450 causes given in the alphabetical list have been arranged in the previously mentioned classification in part in definite groups—infectious diseases, chronic diseases, new growths, and accidental causes—and the remainder are arranged by the organ systems affected—circulatory, respiratory, etc. In each of these groups are listed separately the diseases of greatest import, and the remainder are grouped under other diseases. Thus in the group mental diseases dementia paralytica is shown separately while all other psychoses are grouped under other mental diseases. Similarly, in the group of skin diseases pemphigus appears separately, and in the group chronic poisoning chronic alcoholism appears separately. On the other hand relatively larger numbers of the causes of death listed under infectious diseases and violent death are shown separately in the statistical report. Of the diseases of the respiratory organs 5 are tabulated separately, whereas 24 diseases in the alphabetical list which belong to this group are grouped together under other diseases of the respiratory organs. Among the diseases of the digestive organs 8 are tabulated separately and 34 are grouped together under other diseases of the digestive tract.

* * * * * * *

"A comparison between the Swedish and the German instructions shows that here in Sweden the physician makes decisions, but in Germany the matter is left to those who compile the statistics. If the patient has suffered from two major diseases, the physician in Sweden decides which of the diseases contributed most to the patient's death. It does not always follow that the disease which is considered in general the most serious is the one which contributed most to the death. In Germany in such a case the most serious of the diseases mentioned is considered the principal cause of death. Further, the German instructions show quite specifically which diseases take precedence over others. Violent causes of death usually take precedence over all others; acute diseases take precedence over chronic, infectious over noninfectious, and acute infectious over chronic infectious.

* * * * * * *

"The rule amongst us [in Sweden] that the physician himself shall decide the predominating cause of the patient's death is preferable because the decision is then made from the point of view of the medical expert. I can not go into more detail concerning the question as to what should be given as the principal cause of death in cases of so-called competition in causes of death. If the physician experiences any difficulty in reaching a decision as to the principal cause of death, he can in general follow the German instructions concerning precedence for certain diseases, instructions which on the whole agree with the point of view which in my judgment is the basis of the alphabetical list and cause of death nomenclature mentioned in this article. In the meantime the most important point of all is that the physician should interpret correctly the meaning of the not very fortunate phrase 'principal cause of death' and should not answer the question by what might be called the medical cause of death; for example, a patient naturally does not die of appendicitis but of peritonitis; peritonitis is, of course, the cause of death, and as another patient can not have died from a crushed finger without septicemia, the latter must be given as the cause of death. Such an interpretation shows complete misunderstanding of the significance of the statistics of cause of death.

"Causal connections should not be considered beyond certain limits. In case of an intoxicated person, who because of intoxication falls in the sea and drowns, drowning and not acute alcoholic poisoning should be given as the cause of death. For my own part, I must say that I believe the decisions go too far which specify that an accidental death as a result of an epileptic attack should be given as epilepsy, and suicide by an insane person should be ascribed to insanity. Two subsections of the accident and suicide groups are lost through these decisions,

groups which to social hygiene would be very interesting.[35] Statistics should be so compiled that they serve practical purposes, but in case of the rules just mentioned little note seems to have been taken of this principle.

* * * * * * *

"In a considerable portion of the primary returns which have been sent to the central statistical bureau, as was previously mentioned, the instructions of the health administration were not followed. Often several diseases were given as causes of death without special information as to which was the principal cause; for example, 'ambulant erysipelas and pulmonary tuberculosis and cancer uteri et vesicae,' 'organic heart disease and chronic endocarditis and chronic nephritis and diabetes mellitus,' 'fetid bronchitis and pulmonary abscess and hernia crural, incarcer and psychoses and dermoid cysts of the sacral region.' In many cases of this type it has been difficult and often impossible to determine the principal cause. In other cases the combination of diseases and other circumstances give a clue; for example, 'paralysis cordis and cholelithiasis;' 'acute pneumonia and appendicitis.' When these cases occurred in a hospital it is clear that the latter disease was followed by another disease after the operation. Many physicians stationed in hospitals have plainly followed the pathological anatomical diagnosis of the autopsy, and many of the previously mentioned designations in death certificates have arisen in this way. Another type of designation has been 'septicemia post hysterectomy,' and in this case it is not possible to tell what was the principal cause of death. In some cases physicians have given designations which do not appear in the alphabetical list; as, for example, 'alimentary intoxication,' and 'pedatrophia,' which diseases I changed to acute and chronic gastroenteritis, respectively. In a number of cases the cause of death given by the pastor [36] was allowed to remain as the physician evidently could not give any other; for example, stroke, teething fever, sudden chill, chest disease, mother passion, rheumatic fever, nervous prostration, stomach trouble. Not infrequently such causes are approved by the physician; indeed in some cases they are even filled in by physicians. Many such cases (for example, the term "sudden chill") had to be placed in the group 'no cause given;' some cases could be placed under 'other diseases' of certain groups; for example, 'nervous prostration' under 'other diseases of the nervous system.' In certain cases the age of the deceased gave a hint for the decision as to where the case should be classified.

"It has been impossible for me to overlook the fact that many inconsistencies arise from the rules for deciding what disease shall be considered the principal cause of death where many diseases are given or where causes shall be classified which are not given in the alphabetical list. In the beginning of the work too much emphasis was placed on the rule, which appears both in the Swedish and in the German instructions, that the fundamental or major disease should be considered the principal cause of death. I made a diagnosis, so to speak, from the death certificate, naturally with careful attention to giving preference of those diseases which should under the rules have precedence over others. But in the meantime I discovered by degrees that cases with several diseases and symptoms stated fall usually into one of two groups. In one group the diseases were given without any definite order, and in the other it was apparently meant that the first-given disease was the major one and that the following were contributory diseases. Because of the introduction of this last-named point of view a great many inconsistencies have no doubt arisen. When the diseases given were of nearly equal importance, such as measles and whooping cough, bronchitis, and acute gastroenteritis, the disease first given was throughout taken as the principal cause of death." [37]

ENGLAND AND WALES

The rules used in England and Wales are as follows:

"1. In cases where the effect of any two rules appears to be at variance, the first stated is to be followed, unless the second refers explicitly to an exception to be made in the application of the first.

"2. In cases of the separate statement as joint causes of death of two diseases the names of which are components of a single compound pathological term the

[35] In the final preparation of the figures relating to cause of death at the central statistical bureau the instruction that suicide during insanity should be classified as insanity was not followed. Such cases are entered under suicide, but they are differentiated. Certain physicians, however, very carefully followed the instructions that these cases should be entered under insanity as the principal cause of death but did not give suicide as a contributory cause. In such cases the correction could not be made in the final figures.

[36] In Sweden clergymen serve as registrars of births, deaths, and marriages.

[37] Hultquist, Gustaf: "Några anmärkningar till var nya dödsorsaksstatistik." Allmänna Svenska Läkartidningen, 11th year, No. 51, Dec. 18, 1914, p. 1179.

death is generally to be classed as indicated in the manual for the compound term, e. g., gastritis, enteritis, treat as gastroenteritis. (This does not apply to bronchitis, pneumonia.)

"3. The general order of preference is as follows:

a. Violence (Nos. 155–186).
b. General diseases (Nos. 1–59).
c. Local diseases (Nos. 60–149).
d. Ill-defined causes of death (Nos. 187–189).
(For Nos. 150–154, see rule 8.)

VIOLENCE

"4. Where any forms of violence and disease are jointly stated as causes of death, the violence is to be preferred except in the following instances:

(*a*) Deaths from any definite disease stated to have been accelerated by accident are to be classed to the disease.
(*b*) Deaths during or resultant from operation or the administration of an anesthetic are to be classed to the disease or injury for which the operation was performed.
(*c*) Deaths from pneumonia or other lung diseases consequent upon accidental immersion are to be classed to the disease.
(*d*) Deaths from injuries received during an epileptic or apoplectic fit are to be classed to epilepsy or apoplexy as the case may be.
(*e*) Deaths from tetanus, erysipelas, pyemia, septicemia, blood-poisoning, etc., following accident are to be classed to the disease if the injury was slight, such as 'scratch' or 'abrasion,' but if the injury was apparently severe enough to kill by itself (e. g., by vehicle, machinery, etc.), the death is to be classed to violence.
(*f*) Deaths from cancer and accident in conjunction are to be classed to cancer.

GENERAL DISEASES

"5. Any general disease, except—

(*a*) Membranous laryngitis (9B) and croup (9C), which for this purpose are regarded as local diseases, and—
(*b*) Undefined anemia and chlorosis (in 54), other tumors (46), and chronic rheumatism (48A), which for this purpose rank below all except the ill-defined causes of death,

is to be preferred to any local disease except aneurism (81A), strangulated hernia and acute intestinal obstruction (in 109), and puerperal fever, phlebitis, and diseases of the breast (137, 139A, and 141), which for this purpose are included with the general diseases in Group I below.

"6. The general diseases are divided into four groups in order of their importance for the purpose of selection. Any disease in Group I is to be selected in preference to any other not in Group I; any in Group II is to be preferred to any other not in Groups I and II, and so on. If two or more of the diseases in any group are stated together the disease of longest duration or that first mentioned in the certificate, should as a rule be chosen. (See rule 10.)

Group I

5. Smallpox.
12. Asiatic cholera.
21. Glanders.
22. Anthrax (splenic fever).
23. Rabies.
24. Tetanus.
39–45. Cancer (all forms).
57–59. Chronic lead and other chronic poisonings.
81. Aneurism.
In 109. Strangulated hernia and acute intestinal obstruction.
137. Puerperal fever.
139A. Puerperal phlegmasia alba dolens and phlebitis.
141. Puerperal diseases of the breast, and other epidemic diseases of exceptional interest such as Mediterranean fever (3B), plague (15), yellow fever (16), leprosy (17), beri-beri (27), etc.

Group II

1. Enteric fever.
2. Typhus.
3A. Relapsing fever.
4. Malaria.
6. Measles.
7. Scarlet fever.
8. Whooping cough.
9A. Diphtheria.
14. Dysentery.

Group III	Group IV
10. Influenza.	18. Erysipelas.
25. Mycoses.	19A. Mumps.
28–35. Tuberculosis (all forms).[38]	19B. German measles.
37–38. Venereal diseases.	19C. Varicella.
47. Rheumatic fever.	20(A. B.). Pyemia and septicemia.[39]
52. Addison's disease.	36. Rickets, softening of bones.
	48B. Osteoarthritis.
	48C. Gout.
	49. Scurvy.
	50. Diabetes.
	51. Exophthalmic goitre.
	53. Leucocythemia, Lymphadenoma.
	In 54. Pernicious anemia.
	55. Other general diseases.

"7. If one of the diseases mentioned is an immediate and frequent complication of another the primary disease should be preferred to its complication.

"8. The conditions comprised under headings 150–154 are to be dealt with as follows, notwithstanding anything to the contrary implied in any preceding rule.

(*a*) Congenital defects (150), premature birth (151A), icterus neonatorum (151C), and sclerema and edema neonatorum (151D)—under 3 months these conditions are to be preferred to any disease except syphilis and the diseases in Groups I and II. Over 3 months any definite disease not presumably the consequence of a congenital defect is to be preferred to these conditions. Premature birth (151A) is to be preferred to congenital defects (150) and other diseases peculiar to early infancy (152) when occurring together on the same certificate.

(*b*) Other diseases peculiar to early infancy (152) are to receive the same preference as congenital defects under 3 months of age.

(*c*) Atrophy, debility, and marasmus of infants (151B), want of breast milk (151E), and senile decay (154B) are to be treated as ill-defined causes of death.

(*d*) Lack of care (153) is to be treated for this purpose as a form of violence.

(*e*) Senile dementia (154A) is to be treated in the same manner as other forms of insanity. (See rule 9.)

LOCAL DISEASES

"9. The following are to be selected in preference to any other local diseases appearing in the same certificate, except aneurism (81A), strangulated hernia, and acute intestinal obstruction (in 109), and puerperal fever, phlebitis, and diseases of the breast (137, 139A, and 141):

Column A	Column B
61A. Cerebrospinal fever.	62. Locomotor ataxia.
61B. Posterior basal meningitis.	63. Other diseases of spinal cord.
78B. Infective endocarditis.	67. General paralysis of insane.
92A. Lobar pneumonia.	68. Other forms of mental alienation.
104 and 105A. Infective enteritis.	69. Epilepsy.
106, 107, 112, 121, and other headings according to part affected. Parasitic diseases (except thrush).	74A. Idiocy, imbecility.
	74C. Cerebral tumor.
	154A. Senile dementia.
108. Appendicitis.	
143. Carbuncle, boil.	
144A. Phlegmon.	

"A disease in column A is to be preferred to any disease in column B when occurring upon the same certificate. (See also rules 6 and 10.)

"10. Where two or more local diseases, neither of which is included in the preceding list, are certified together, that of longest duration should be preferred; if duration is not recorded, any disease of a chronic nature should be preferred

[38] Deaths from tubercle of two or more organs should be assigned to No. 28 or No. 29 if the lungs are involved; otherwise to 35. (See notes to Nos. 28 and 35, pp. 5 and 8).

[39] Pyemia and septicemia are subject to rule 7, but in cases where the application of this rule causes a local disease to be preferred to either of them, the local disease acquires Group IV precedence.

to a disease not so characterized; if neither disease can be assumed to be chronic, the first mentioned on a medical certificate should be selected. Exceptions to this rule are as follows:

(*a*) Any definite disease of the heart (77–80 and 85A) or kidney (119–122) is to be preferred to any disease of the respiratory system (86–98).

(*b*) Congestion of any organ, convulsions (70 and 71), hemorrhage (85C), laryngismus stridulus (87A), thrush (99B), and dyspepsia (in 103B and 104 and 105E) rank below all except the ill-defined causes of death. Alcoholism, however stated, takes the same rank, in view of the treatment of organic disease attributed to it. (See pp. xi and xiv.)

(*c*) Arterial sclerosis (81B), heart diseases (77–80 and 85A), cirrhosis of the liver (113), and Bright's disease (120A) are to be preferred to apoplexy (64A), cerebral hemorrhage (64E), hemiplegia (66A), and cerebral embolism and thrombosis (82A), which, on the other hand, are to be preferred to bronchitis (89 and 90B).

(*d*) Cirrhosis of the liver with neuritis is to be taken as alcoholic cirrhosis of liver (113B).

(*e*) In the case of deaths occurring in lunatic asylums, nervous diseases other than those mentioned under (*b*) and (*c*) are to be preferred to other local diseases, except those receiving special preference under rules 6 and 9.

"NOTE.—The foregoing rules have been framed primarily for the selection of one from two jointly stated causes of death. Where three or more causes are jointly stated it may occasionally be found that the effect of different rules is conflicting. In these cases, which are infrequent, the coder must rely upon his own judgment for guidance as to the rule to be followed." [40]

PROPORTION OF CASES REPORTING JOINT CAUSES

The rules for classifying joint causes are, of course, applicable only to those deaths for which two or more causes are stated. The importance of these rules depends, therefore, upon the proportion of cases thus reported. In practice, furthermore, since one cause is commonly stated as primary or most important, the additional information as to the existence of a secondary cause is essential only in those cases in which the so-called secondary cause is, according to the rules, the preferred or true one. Hence the rules are of practical importance only in "correcting," as to order of importance, the entries made by the physicians. In other words, the rules insure the same classification of similar cases in which the physicians have differed in deciding which of two causes—both of which are stated on the death certificate—was primary.[41]

Evidence in regard to the proportion of cases in which secondary causes are given is meager. In the United States in 1917 the proportion of all deaths for which secondary causes were stated was 34.9 per cent.[42] Of the puerperal deaths, 39.5 per cent were reported as due to two or more causes. Since many of the secondary causes, however, were also puerperal, a better indication of the possible influence of changes in preference is given by the proportion of puerperal deaths that were complicated by nonpuerperal conditions. Of these deaths a much smaller proportion, only 18.7 per cent, were reported as complicated by nonpuerperal causes.[43] On the other hand, puerperal causes were contributory to deaths classified as due to nonpuerperal causes in cases equal to 10 per cent of the maternal deaths.

APPLICATION OF RULES FOR CLASSIFYING JOINT CAUSES

Specific detailed evidence as to the actual practice of different countries in applying the rules of the International Commission for classifying deaths from joint causes is available for only two countries, the United States and England

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[40] Manual of the International List of Causes of Death as Adapted for Use in England and Wales, based on the second Decennial Revision by the International Commission, Paris, 1909, pp. xxxii–xxxvi. London, 1912.

[41] The death certificates used in many countries (for example, in the United States, England and Wales, Scotland, Ireland, Switzerland, parts of Australia, and New Zealand) provide spaces both for primary and for secondary causes. The bulletin of the International Statistical Institute already referred to gives also as providing spaces for secondary causes, Prussia, Wurttemburg, France, Hungary, Italy, and Japan.

[42] Compiled from Mortality Statistics, 1918, p. 50 ff. The unit is the International List number; thus, pneumonia complicated with bronchitis, and puerperal albuminuria complicated with "accidents of pregnancy," are considered as joint causes, but not two causes which, if given separately, would each be assigned to the same International List number, that is, are the same "cause."

[43] Ibid., pp. 50–91.

and Wales; the former publishes its rules for classifying joint causes, and the latter publishes details of the contributory causes of deaths classified as puerperal and of the cases in which puerperal conditions were contributory.

The chief difference in practice is in the allocation of deaths from influenza complicated by a puerperal cause. In the United States and in Scotland (until 1921)[44] such deaths have been classified as puerperal, and in England and Wales, and probably in most other countries, they have been classified as due to influenza. In 1918 and to a less extent in 1919 these deaths from influenza complicated by a puerperal condition caused a marked rise in the rate of maternal mortality in the United States and in Scotland; but in other countries no such rise was noted, and in some a slight decrease appeared.

If the rules for classifying these deaths in use in the United States had been applied in England and Wales, then of the 4,144 deaths in 1920 attributed to puerperal causes, 5[45] would have been assigned to other causes; on the other hand, 158 deaths from influenza, as well as 32[46] assigned to other causes, would have been added to the puerperal figures. In addition to these, 34[47] other deaths would probably have been classified as puerperal. And with regard to a large group of 601 deaths from various diseases the classification according to the United States rules would have depended upon whether the case was associated with pregnancy or with childbirth; if with the former they would have been classified as in the English statistics, but if with the latter they would have been transferred to puerperal causes.[48]

The source does not show whether the 601 deaths from various causes were associated with childbirth or with pregnancy; assuming, however, that the same proportion of deaths from each of these causes was associated with childbirth as was so associated among deaths returned from the same cause in connection with either pregnancy or childbirth in the United States registration area in 1917,[49] then roughly 85.2 per cent, or 512 of these deaths, would have been associated with childbirth and would have been classed as puerperal according to the United States rules. If, then, the United States rules for classification had been used, the rate in England and Wales in 1920 would have been raised from 4.33 to 4.97, an increase of 14.8 per cent.[50]

COMPLETENESS OF REGISTRATION OF BIRTHS

Much greater emphasis has been placed upon birth registration in European countries than in the United States. In Europe birth certificates are frequently used for identification purposes and may be called for on many occasions. Thus, in the enforcement of the law providing for compulsory vaccination reliance is placed in part upon the recorded births; and the compulsory school attendance and military service laws require the evidence of age which the birth certificates furnish. These uses to which birth certificates are put have resulted in making the general population thoroughly familiar with the requirement of registration.

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[44] In Scotland in 1920 only 21 deaths from this combination of causes were reported—2.5 per cent of the total puerperal deaths. The exclusion of these deaths would have reduced the rate from 6.15 to 6. Compiled from Sixty-seventh Annual Report of the Registrar-General for Scotland, 1921, p. xxxviii. In 1921 the rule in Scotland was changed so that such deaths might be classified as due to influenza. In the United States in 1917 only 44 deaths from this combination of causes were reported—0.4 per cent of the total puerperal deaths. Information on this point for other years is not available.

[45] 2 from bronchitis complicated with pregnancy and 3 from pyelitis complicated with pregnancy.

[46] Includes pyemia, septicemia, 1; chorea, 7; cerebral embolism and thrombosis, 1; phlebitis, 1; varix, 3; diarrhea and enteritis, 17; and peritonitis, 2.

[47] Includes pregnancy or childbearing associated with "anemia," 29, and with "infective endocarditis," 5. According to the United States rules, if associated with childbirth, all these would have been classified as puerperal; if associated with pregnancy, those complicated with anemia would have been classified as puerperal if the anemia were unqualified or if qualified as cerebral or pernicious, but not if qualified as splenic; those complicated with endocarditis would have been classified as puerperal provided the endocarditis was qualified as malignant, septic, or ulcerative, but not if gonorrheal, rheumatic, acute, chronic, or unqualified.

[48] The principal causes "returned as associated with but not classed to pregnancy and childbearing" were influenza (158), epilepsy (7), acute endocarditis (12), fatty degeneration of heart (15), other organic diseases of heart (73), bronchitis (27), broncho-pneumonia (30), lobar pneumonia (97), pneumonia (63), pleurisy (5), asthma (13), tonsilitis (5), appendicitis (14), intestinal obstruction (20), acute yellow atrophy of liver (13), uterine tumors (17), ovarian cyst (7), all others (25).

[49] Compiled from Mortality Statistics, 1918, pp. 50–91. U. S. Bureau of the Census.

[50] In securing this figure 97 deaths which could not be classified according to the United States printed rules, either because the specific combination of causes is not there given or because the specific cause is not stated in the English tabulation, were distributed between puerperal and nonpuerperal causes in the same proportion, in case of death from each cause, as the deaths jointly from that and a puerperal cause were distributed between puerperal and nonpuerperal causes in the United States birth-registration area in 1917. (Details of joint causes are given in Mortality Statistics, 1918, pp. 50–91.)

In European countries, therefore, birth as well as death registration may be regarded as practically complete.[51]

In passing it is of interest to note that Doctor Farr estimated that in England and Wales even during the period of voluntary registration from 1837 to 1876 birth registration was 95 per cent complete. Under the compulsory law Sir Arthur Newsholme regards registration as practically perfect.[52]

Furthermore, for New Zealand a comparison of birth records with the results of the 1916 census led to the conclusion that "probably unregistered births do not exceed 100 annually." Since the average number of births is in the neighborhood of 25,000, the proportion of unregistered births on this basis would be less than one-half of 1 per cent.[53]

Another point which must be considered in comparing rates is that in three countries (France, Belgium, and the Netherlands) the registered "live births" include only the infants who survive at the time of registration, which must take place within three days after the birth. In Belgium and since 1917 in the Netherlands special analyses of the group "infants born dead or dead at the time of registration" show the number of those who were born alive but who died before registration. In 1920, for example, in the Netherlands, these deaths before registration of infants who were born alive but who were omitted from the statistics of "live births" (levend aangegevenen) equaled 1.1 per cent of the total number of live births.[54] Since an understatement of 1.1 per cent in the number of live births means an overstatement of the same percentage in the maternal mortality rate, the necessity for a correction of the rates for France, Belgium, and the Netherlands must be borne in mind, especially when comparisons are made with rates in other countries.

All the countries using the International List, except England and Wales, Scotland, Ireland, and parts of Australia, require that stillbirths be registered.[55] In New Zealand they have been required to be registered only since 1913.[56] The definitions of stillbirths in use in the several countries are given in Appendix C, page 117.

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[51] For replies from European countries (1912) to the question," Do many births or deaths escape registration?" see Infantile Mortality, Report of the Special Committee * * * of the Royal Statistical Society, pp. 26–35 (London, 1912).

[52] Newsholme, Sir Arthur: The Elements of Vital Statistics in Their Bearing on Social and Public Health Problems, p. 71. London, 1923.

[53] Report on the Results of a Census of the Population of the Dominion of New Zealand, taken for the night of October 15, 1916, p. 13. Wellington, 1920.

[54] Compiled from Statistiek van de Sterfte naar den Leeftijd en de Oorzaken van den Dood over het jaar 1920, Bijdragen tot de Statistiek van Nederland, No. 329, p. xl, and Statistick van den loop der bevolking in Nederland over 1920, Bijdragen tot de Statistiek van Nederland, No. 328, p. xi.

[55] Annuaire Internationale de Statistique; Renseignements sur l'organisation actuelle des statistiques de l'état civil dans divers pays. Annexe aux Tomes I–V (Partie Demographie), p. 6–7. La Haye, 1921.

[56] New Zealand, Statutes, 1912, No. 18, sec. 4.

APPENDIX E.—SUMMARY OF LAWS AND REGULATIONS GOVERNING MIDWIVES IN THE UNITED STATES IN FORCE DECEMBER, 1924

State and source	Examined and licensed by State	Educational or other requirements	Registration	Laws and regulations governing practice	Penalties for violation of requirements of practice	Report births	Report ophthalmia and use prophylactic
ALABAMA [Laws of 1919.]	No; by county board.	Knowledge of midwifery; freedom from communicable disease; moral character.	Local			Yes	Yes.[1]
ARIZONA [Rev. Stat. 1913 and State Board of Health rules.]	Permit only	Indorsement of physician of district.	do	Shall not give drugs, give injection into birth canal, nor make internal examinations; shall secure physician for abnormal cases.	Permit valid so long as law and rules obeyed.	Yes	Report and advise use of prophylactic.
ARKANSAS [State Board of Health rules 1913.]			do			Yes	Do.
CALIFORNIA [Medical Practice Act 1917.]	Yes	Four years' high school; specified professional training and examination.	do	Shall not give drugs, use instruments, make internal examination, nor give injection into birth canal; shall attend normal cases only; must have specified equipment.	Revocation of license; $100–$600 or 60–180 days, or both.	Yes	Report; use of prophylactic optional.[1]
COLORADO [Medical Practice Act 1917.]	do	Examination in such subjects as board deems necessary.	do	Shall not give drugs or anesthetics, use instruments, nor practice medicine in any other form.	Revocation of license; $50–$300 or 10–30 days, or both.	Yes	Yes.
CONNECTICUT [Gen. Stat. 1893 and Laws of 1923.]	do	Graduation from school of midwifery; certificate of character and examination.	State and local; annual.	Shall not prescribe or use drugs, use instruments, perform version, remove adherent placenta, attend cases of other than normal labor or cases of labor until the seventh month of uterogestation shall have passed.	Not more than $100 for each violation of any provision.	Yes	Do.[1]
DELAWARE [Rev. Code 1915.]			Local			Yes	Do.[1]
DISTRICT OF COLUMBIA. [Regulations Board of Medical Supervisors.]	Board of Medical Supervisors.	Graduated nurse or regularly engaged as obstetric nurse for not less than 2 years; actual attendance upon not less than 5 cases of confinement under care of physicians; good moral character.					

FLORIDA [Laws of 1915.]			Local			Yes	Report only.
GEORGIA [Code 1914.]			do			Yes	Yes.
IDAHO [Laws of 1911.]			do			Yes	Do.[1]
ILLINOIS [Medical Practice Act 1923.]	Yes	High school, 1 year; completion of 6 months' course in college of midwifery and graduation therefrom.	do	Shall not treat beyond the scope of license.	Revocation of license; not over $100 or 6 months or both.	Yes	Report only;[1] may advise or use with consent of parent.
INDIANA [Medical Practice Act 1897.]	do	High school, 4 years or equivalent; diploma from obstetric school, and examination.	do		From $25 to $200 or revocation of license.	Yes	Report and use in suspected cases.
IOWA [Laws of 1897.]	do		do			Yes	Yes.
KANSAS [Gen. Stat. 1915.]			do			Yes	Report and use with limitations.[1]
KENTUCKY [State Board of Health Rules 1915.]	Permit only, given by county health officer.	Attendance at annual course of instruction; understanding of essentials of hygiene; freedom from communicable disease.	Local, annual.	Shall not give drugs, use instruments, give injection into birth canal, make internal examination, nor attend abnormal cases; shall observe other specified sanitary rules.	Permit valid so long as law and rules obeyed.	Yes	Yes.[1]
LOUISIANA [Act of 1918.]	Yes	Such examination as required by State board of medical examiners.	Local			Yes	Do.[1]
MAINE [Rev. Stat. 1916.]						Yes	Report; use prophylactic unless parents object.
MARYLAND [Laws of 1924.]	do	Certificate of moral character and of qualification for licensure and examination by 2 physicians.	Local	Shall not give drugs, use instruments, make internal examinations, nor attend abnormal cases.	Not less than $5 nor more than $100; revocation of license for second offense, and for procuring an abortion or inducing premature labor.	Yes	Yes.[1]
MICHIGAN [Laws of 1915.]						Yes	Do.
MINNESOTA [General Stat. 1913.]	Yes	Diploma from school of midwifery or examination.	No		Revocation of license.	Yes	Report and use prophylactic unless parents object.[1]
MISSISSIPPI [State Board of Health rules 1912.]	Permit given by county health officer.	Attendance at class instruction, investigation as to character, cleanliness, etc.	Local	Shall not give drugs, use instruments, give injection into birth canal, nor attend abnormal cases; must have specified equipment.	From $5 to $100 or 60 days, or both.	Yes	Yes.[1]
MISSOURI [Rev. Stat. 1909.]	Yes	Examination in obstetrics	do	Shall engage in no other branch of medical practice.	From $10 to $50 or 10 days to 2 months, or both.	Yes	Do.

[1] Gratuitous distribution of a prophylactic is made by the State health authorities.

APPENDIX E.—*Summary of laws and regulations governing midwives in the United States in force December, 1924*—Continued

State and source	Examined and licensed by State	Educational or other requirements	Registration	Laws and regulations governing practice	Penalties for violation of requirements of practice	Report births	Report ophthalmia and use prophylactic
MONTANA [Rev. Code 1921.]			Local			Yes	Report; use of prophylactic optional.[1]
NEBRASKA [Act of 1919.]						Yes	
NEVADA [Rev. Laws 1912.]			Local			Yes	Yes.
NEW HAMPSHIRE [State Board of Health rules 1916.]			do	Shall not give drugs nor use instruments; local health boards must have physician or nurse visit all cases attended by midwives.		Yes	Do.[1]
NEW JERSEY [Laws of 1910 and 1923.]	Yes	Common school or equivalent; certificate or diploma from school of midwifery or maternity hospital having 1,800 hours' instruction within a period of not less than 9 months, and examination.	do	Shall not give drugs; shall secure physician in all abnormal cases of mother or infant.	$200 or 100 days if fine not paid; revocation of license.	Yes	Report;[1] use of prophylactic optional.
NEW MEXICO [State Board Public Welfare rules 1921.]	Permit and physical examination annually.	Attendance at series of 10 classes of instruction, signing of midwife's pledge, and freedom from communicable disease.	do	Shall not give drugs, give injection into birth canal, use instruments, nor make internal examination; shall call physician in all abnormal cases, and have specified equipment.	Certificate may be annulled.	Yes	Yes.
NEW YORK [Gen. Laws 1922.][2]	Examine and license annually.	Ability to read and write (waived for foreigners); either diploma from school of midwifery or other satisfactory evidence.	do	Shall not give drugs, use instruments, remove adherent placenta, perform version, nor treat disease; shall attend normal cases only.	License revoked	Yes	Do.
NORTH CAROLINA [Stat. 1919.]	Permit only	Must not be addicted to drugs or habitual drunkenness.	State	Disinfection of hands of practitioners required.	From $5 to $10	Yes	Do.[1]
NORTH DAKOTA [Laws of 1907.]			Local			Yes	Report; use prophylactic in suspected cases.
OHIO [Medical Practice Act 1910.]	Yes	High school or equivalent, diploma from school of midwifery or license of foreign country, and examination.	do	Shall not perform version, treat breech or face presentation, or other abnormal conditions, nor use instruments.	Refusal, suspension, or revocation of license for unprofessional conduct.	Yes	Yes.
OKLAHOMA [Laws of 1917.]			do			Yes	Do.[1]
OREGON [Laws of 1915.]			do			Yes	Do.

PENNSYLVANIA [Laws of 1913 and Department of Health rules.]	Yes	Graduation from approved school of midwifery; or other satisfactory evidence, and examination in English language only.	do	Shall not prescribe drugs nor perform operations other than tying cord; shall notify inspector of all abnormal cases, also of delayed labor; other sanitary requirements.	From $10 to $50 or 10 to 50 days, or both; license may be revoked or suspended.	Yes	Do.
RHODE ISLAND [Laws of 1918.]	Licensed only			State board of health makes rules and regulations.	Not over $100 or 6 months or both; license may be revoked.	Yes	Do.[1]
SOUTH CAROLINA [State Board of Health rules 1920.]	Permit only	Completion of course of 10 lessons given by State board of health; signing of midwife pledge.	Local	Shall not give drugs, give injection into birth canal, nor make internal examinations; shall secure physician for abnormal cases and obey rules of personal hygiene.	Permit may be revoked.	Yes	Report; use of prophylactic advised.
SOUTH DAKOTA [Laws of 1913.]						Yes	Report only.[1]
TENNESSEE [Act of 1913.]			Local			Yes	Yes.
TEXAS [Laws of 1911.]						Yes	Shall use prophylactic.[1]
UTAH [Laws of 1917.]			Local			Yes	Report; advise use of prophylactic.[1]
VERMONT [Gen. Laws of 1917.]						Yes	Yes.[1]
VIRGINIA [Laws of 1918; State Board of Health rules.]	Permit only		Local	Shall not give drugs, give injection into birth canal (except when ordered by doctor); make internal examination, nor attend abnormal cases; shall obey other sanitary rules.	Revocation of permit	Yes	Do.[1]
WASHINGTON [Acts of 1917.]	Yes	Common-school education, diploma from school of midwifery, application indorsed by physician, and examination.	do	Shall not prescribe medicine or drugs; shall call physician in abnormal cases; shall report puerperal contagion or infectious disease to health officer.	Revocation of license; $80–$200 or 10 days to 6 months, or both.	Yes	Do.
WEST VIRGINIA [Code of 1913.]	Yes		Local			Yes	Do.[1]
WISCONSIN [Stat. 1919.]	Yes	Diploma from college of midwifery, evidence of good moral and professional character, and examination.	do	Shall not administer drugs, use instruments or any artificial means, remove adherent placenta, nor undertake any other form of medical practice.	Revocation of license; $25–$100 or not over 6 months, or both.	Yes	Do.[1]
WYOMING [Comp. Stat. 1910.]						Yes	Do.[1]

[1] Gratuitous distribution of a prophylactic is made by the State health authorities.

[2] New York City and Rochester have special laws.

APPENDIX F.—SUMMARY OF LAWS AND REGULATIONS GOVERNING MIDWIVES IN CERTAIN FOREIGN COUNTRIES

Country and date of enactment	Examination and license	Educational or other requirements	Registration	Laws and regulations governing practice	Penalties for violation of requirements of practice	Remarks
AUSTRIA [Ministerial decree of Sept. 10, 1897, amended by decree of April 17, 1924.]	Diploma issued by school of midwifery.	Diploma issued to person who has finished prescribed course of 10 months, is considered qualified for the occupation of midwifery, and passes both preliminary and final examination. Completion of course prerequisite to application for license.	Local (administrative authorities).	Regulated by decree which prescribes details of professional conduct, enumerates articles in outfit, and describes operations midwife is not allowed to perform.	No information	Supervised by local public-health officer.
BELGIUM [Royal decree of Sept. 6, 1924.]	Diploma of midwifery given upon passage of examination.	Only the following admitted to examination: (1) Graduates of schools of midwifery with 2-year course given by doctors of medicine. To each school must be attached maternity clinic with at least 50 confinements per year for each 10 pupils. (2) Recipients of State nurse's diploma, who have had 1 year of instruction at school of midwifery.	Local (medical commission of Province).	Prescribe in detail conduct while on case; enumerate circumstances in which midwife must send for physician and require her to report immediately each case of puerperal fever and death of mother and child during or as result of labor; forbid use of instruments for accelerating delivery and enumerate other things she is not allowed to do.	Fines or suspension from practice for a period up to 1 year.	Must report immediately to chairman of provincial medical commission every case of puerperal fever in her practice. If 2 or more cases of puerperal fever take place in succession in a midwife's practice, chairman of commission may suspend her from practice for 2 weeks. If parturient woman or the child dies during or as result of delivery and if midwife was not assisted by physician she must report fact within 24 hours to chairman of commission.

DENMARK [Laws of Nov. 30, 1714, and 1810 and several later decrees.]	Licenses issued by special examining commission.	1 year in school of midwifery prerequisite to application for license. (Apparently only one school of midwifery and that belongs to the State.)	Before beginning practice must report to district health officer. (This seems to be equivalent to registration.)	By order of Nov. 25, 1896, required to report each case of puerperal fever, pemphigus, ophthalmoblennorrhea neonatorum to district physician.	Chief health officer of Province may suspend midwife from practice for a certain period; for serious offenses fines are prescribed, diploma may be withdrawn, or salary or pension reduced.	If puerperal fever appears in midwife's practice, public-health officer may suspend her from practicing for not more than 4 weeks.
ENGLAND AND WALES. [Midwives act of 1902, amended in 1918.]	Central Midwives' Board conducts examinations and issues certificates.	Course of 6 months for untrained women and 4 months (or in some cases three months) for certain trained nurses.				
FRANCE [Law of Nov. 30, 1892.]	Diploma issued by school where course is taken and examination passed, instruction given at medical schools of universities, which are all State institutions. Also at schools of midwifery at municipal or private maternity hospitals.	2 years' course at medical school, preparatory school of medicine and pharmacy, or maternity hospital.	Local (Prefect's office or civil court of district.)	Prohibits use of instruments; requires midwife to call physician or public-health officer in case of difficult labor and to report all epidemic cases; forbids prescribing medicines.	Fines or imprisonment.	
GERMANY	Legislation on the practice of midwifery differs in every German State. National legislation refers only to penalties for women practicing without a license and to midwives failing to report births. Men may practice midwifery without a license, but in such cases they may not call themselves "Geburtshelfer"; this title can be used only by men who had the proper training; a fine is prescribed for violation of this law. In 1917 the Federal Government issued standards for the uniform regulation of midwifery and recommended enactment of corresponding laws by the States. So far (end of 1924) Prussia and Saxony only have followed the recommendation.					
BAVARIA [Royal decree June 4, 1899.]	Schools of midwifery. In most cases State institutions; some belong to local government.	4 months in Government school of midwifery.	Local (present diploma to local police authorities and report personally to district public-health physician.)	Rules contained in instructions issued June 9, 1899, prescribe in great detail conduct on normal and abnormal cases; method of dealing with puerperal fever and other infectious cases. By ministerial order of Apr. 5, 1909, midwife must call physician in abnormal cases.	Prescribed by instructions issued June 9, 1899.	Supervised by district public-health physician and district police authorities. Former watches professional work, observes condition of instruments, visits at house, and gives "repetition tests" at intervals.
PRUSSIA [Law of July 20, 1922.]	License by local health officer. Diploma issued by president of province to whom chairman of examining board forwards examination papers.	18 months in school of midwifery prerequisite to application for license. Most schools are State institutions. Private institutions must be approved by minister of welfare.	Local (permission to settle and practice in given locality must be obtained from local health officer).	Enumerate duties of midwife and regulate conduct; require her to take repetition test before local health officer every 2 years and postgraduate course every 5 years unless over 55 years old.	Fines or withdrawal of permission to practice.	Supervised by local public-health officer.

APPENDIX F.—*Summary of laws and regulations governing midwives in certain foreign countries*—Continued

Country and date of enactment	Examination and license	Educational or other requirements	Registration	Laws and regulations governing practice	Penalties for violation of requirements of practice	Remarks
SAXONY [Royal decree of April 2, 1818, amended in 1924 to conform to standards recommended by Federal Government in 1917.]	Diploma and license issued by public-health authorities after examination.	1 year in school of midwifery a prerequisite to application for license.	Local (must be appointed by local authorities as "district midwife." This seems to take place of registration).	Laws and regulations prescribe in detail rules of midwife's conduct while on case and also outside her work; specify instruments and other articles she must have in her possession; enumerate conditions under which she must send for a physician.	Fines, arrests, or suspension of practice are penalties provided.	Supervised by local public-health physician.
HUNGARY [Law of 1876.]	License issued by person in charge of municipal public-health work (chief health officer), after examination.	5 months' course in a school of midwifery prerequisite to application for license in case of every woman living within 75 kilometers of a university or school of midwifery; if living at a longer distance may be given a diploma by the health physician of the Province.	No information	Regulated by ministerial order of Oct. 3, 1902, which forbids midwife to perform certain kinds of work outside her profession and enumerates circumstances in which she must call physician.	No information	Supervised by chief health officer of municipality, who verifies and registers midwife's diploma. Municipalities are divided into districts, health officers of which also exercise supervision.
ITALY [Law on public health, Dec. 22, 1888.]	University of district where course is taken.	2 years in school of midwifery. Apparently all these schools are State institutions—either schools of obstetrics in cities where there are medico-surgical schools or higher obstetrical gynecological institutions. Course may also be taken at some other schools belonging to State universities.	Local (register diploma at office of commune).	Regulated by royal decrees of Feb. 23, 1890, and May 28, 1914, forbidding use of surgical instruments or performance of certain enumerated manipulations.	Various penalties	Supervision consists in registering diploma within 1 month of settling in given locality; reporting each case to local authorities. If puerperal infection develops, midwife must report case to the local health officer. In case of puerperal infection midwife must not approach another without permission from health officer; she may also be ordered by mayor to abstain from practice 5 days or longer.

THE NETHERLANDS. [Royal decree of Feb. 12, 1879.]	Diploma issued, after examination, by examining commission appointed by royal order.	2-year course in State school of midwifery.	Local (chief public-health inspector).	Midwife to take normal cases only. In all other cases must call qualified physician, or in his absence, another midwife. If operation can not be delayed she may perform one but without use of obstetrical instruments.	Fines and imprisonment.	Apparently no regular supervision over midwives, except that they are compelled by law to furnish to the State supervisors of public health all the information requested by them.
SPAIN [General regulations on public health, Jan. 12, 1904.]	Licensed by medical faculties of State universities. Examined by board of university.	2-year course at medical school of a State university ("official studies" or "unofficial studies.") (General regulations on public instruction define unofficial students as those studying outside of State establishments but passing examinations at State institutions.)	Local (local public-health authorities).	Midwife permitted to care for normal cases only; in case of abnormality or accident she must ask for a physician.	Penalties provided in sec. 67 of general regulations on public health.	Supervised by the local public-health officer.
SWEDEN [Regulations on midwifery of Nov. 21, 1919.]	Diploma required, issued by school and countersigned by public-health authorities.	Course lasts 1 year for midwives of first class and 9 months for those of second class. In case of former, additional 3 months are spent in instruction in use of forceps and performance of certain operations.	Local (with medical "foremen").	Midwife may operate only in emergency and then must have one or more witnesses; never allowed to refuse case.	Fines	Supervised by public-health authorities of district.

APPENDIX G.—GENERAL TABLES

GENERAL TABLE 1.—*Maternal mortality rates, by cause of death; United States expanding death-registration area, 1900–1921*

Year	Estimated population, July 1	Deaths from puerperal causes					
		Number			Rate per 100,000 population		
		Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
1900	30,765,618	4,106	1,769	2,337	13.3	5.7	7.6
1901	31,370,952	4,294	1,882	2,412	13.7	6.0	7.7
1902	32,029,815	4,164	1,813	2,351	13.0	5.7	7.3
1903	32,701,083	4,569	1,992	2,577	14.0	6.1	7.9
1904	33,345,163	5,109	2,291	2,818	15.3	6.9	8.5
1905	34,052,201	5,077	2,309	2,768	14.9	6.8	8.1
1906	41,983,419	6,341	2,622	3,719	15.1	6.2	8.9
1907	43,016,990	6,719	2,908	3,811	15.6	6.8	8.9
1908	46,789,913	7,344	3,271	4,073	15.7	7.0	8.7
1909	50,870,518	7,791	3,427	4,364	15.3	6.7	8.6
1910	53,831,742	8,455	3,892	4,563	15.7	7.2	8.5
1911	59,183,071	9,456	4,376	5,080	16.0	7.4	8.6
1912	60,359,974	9,035	3,905	5,130	15.0	6.5	8.5
1913	63,200,625	10,010	4,542	5,468	15.8	7.2	8.7
1914	65,813,315	10,518	4,664	5,854	16.0	7.1	8.9
1915	67,095,681	10,237	4,214	6,023	15.3	6.3	9.0
1916	71,349,162	11,642	4,786	6,856	16.3	6.7	9.6
1917	74,984,498	12,528	5,211	7,317	16.7	6.9	9.8
1918	81,333,675	18,177	5,250	12,927	22.3	6.5	15.9
1919	85,166,043	14,488	4,950	9,538	17.0	5.8	11.2
1920	87,486,713	16,776	5,800	10,976	19.2	6.6	12.5
1921	88,667,602	15,027	6,057	8,970	16.9	6.8	10.1

GENERAL TABLE 2.—*Maternal mortality rates, by cause of death; death-registration States* [1] *as of 1900, 1900–1921*

Year	Estimated population, July 1	Registered live births	Estimated live births [2]	Deaths from puerperal causes								
				Number			Rate per 100,000 population			Rate per 1,000 estimated live births		
				Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
1900	19,995,213	399,764	512,416	2,682	1,155	1,527	13.4	5.8	7.6	5.2	2.3	3.0
1901	20,408,869	396,265	504,531	2,704	1,124	1,580	13.2	5.5	7.7	5.4	2.2	3.1
1902	20,822,526	409,088	512,691	2,626	1,092	1,534	12.6	5.2	7.4	5.1	2.1	3.0
1903	21,236,179	426,736	529,940	2,778	1,153	1,625	13.1	5.4	7.7	5.2	2.2	3.1
1904	21,649,836	438,976	531,550	3,216	1,403	1,813	14.9	6.5	8.4	6.1	2.6	3.4
1905	22,063,490	450,302	529,288	3,219	1,401	1,818	14.6	6.4	8.2	6.1	2.6	3.4
1906	22,477,147	484,804	551,960	3,229	1,302	1,927	14.4	5.8	8.6	5.9	2.4	3.5
1907	22,890,804	510,855	568,876	3,448	1,476	1,972	15.1	6.4	8.6	6.1	2.6	3.5
1908	23,304,457	537,452	581,983	3,343	1,431	1,912	14.3	6.1	8.2	5.7	2.5	3.3
1909	23,718,114	530,193	562,732	3,422	1,453	1,969	14.4	6.1	8.3	6.1	2.6	3.5
1910	24,129,977	554,373	579,863	3,641	1,624	2,017	15.1	6.7	8.4	6.3	2.8	3.5
1911	24,535,075	571,466	593,103	3,806	1,748	2,058	15.5	7.1	8.4	6.4	2.9	3.5
1912	24,940,176	586,656	597,041	3,527	1,488	2,039	14.1	6.0	8.2	5.9	2.5	3.4
1913	25,345,275	597,389	600,071	3,789	1,661	2,128	15.0	6.6	8.4	6.3	2.8	3.5
1914	25,750,376	623,427	619,258	3,954	1,686	2,268	15.4	6.5	8.8	6.4	2.7	3.7
1915	26,155,475	633,859	622,266	3,859	1,547	2,312	14.8	5.9	8.8	6.2	2.5	3.7
1916	26,560,573	644,613	628,141	3,919	1,620	2,299	14.8	6.1	8.7	6.2	2.6	3.7
1917	26,965,674	663,798	656,628	4,167	1,719	2,448	15.5	6.4	9.1	6.3	2.6	3.7
1918	27,370,773	662,907	659,397	5,621	1,536	4,085	20.5	5.6	14.9	8.5	2.3	6.2
1919	27,775,874	616,083	615,864	4,241	1,439	2,802	15.3	5.2	10.1	6.9	2.3	4.5
1920	28,180,973	653,714	653,842	4,943	1,705	3,238	17.5	6.1	11.5	7.6	2.6	5.0
1921	28,586,073	668,226	668,404	4,317	1,735	2,582	15.1	6.1	9.0	6.5	2.6	3.9

[1] Includes District of Columbia.

[2] For method of estimate see pp. 51–52.

GENERAL TABLE 3.—*Maternal mortality rates, by cause of death; District of Columbia and each State included in the death-registration area of 1900, 1900–1921*

State and year	Estimated population, July 1	Registered live births from State reports	Estimated live births[1]	Deaths from puerperal causes								
				Number			Rate per 100,000 population			Rate per 1,000 live births		
				Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
Connecticut:												
1900	910,161	20,560	22,568	118	52	66	13.0	5.7	7.3	5.2	2.3	2.9
1901	931,056	20,294	22,587	111	41	70	11.9	4.4	7.5	4.9	1.8	3.1
1902	951,950	21,216	23,667	128	48	80	13.4	5.0	8.4	5.4	2.0	3.4
1903	972,844	21,751	24,156	128	43	85	13.2	4.4	8.7	5.3	1.8	3.5
1904	993,739	22,864	24,925	131	48	83	13.2	4.8	8.4	5.3	1.9	3.3
1905	1,014,633	23,271	24,870	152	58	94	15.0	5.7	9.3	6.1	2.3	3.8
1906	1,035,528	24,641	25,792	141	56	85	13.6	5.4	8.2	5.5	2.2	3.3
1907	1,056,422	25,945	26,933	142	68	74	13.4	6.4	7.0	5.3	2.5	2.7
1908	1,077,316	26,694	27,628	126	46	80	11.7	4.3	7.4	4.6	1.7	2.9
1909	1,098,211	26,431	27,459	144	45	99	13.1	4.1	9.0	5.2	1.6	3.6
1910	1,120,461	27,314	28,593	148	65	83	13.2	5.8	7.4	5.2	2.3	2.9
1911	1,147,849	28,176	29,578	129	57	72	11.2	5.0	6.3	4.4	1.9	2.4
1912	1,175,235	29,039	30,300	176	61	115	15.0	5.2	9.8	5.8	2.0	3.8
1913	1,202,621	30,122	31,203	143	56	87	11.9	4.7	7.2	4.6	1.8	2.8
1914	1,230,007	31,300	32,062	176	61	115	14.3	5.0	9.3	5.5	1.9	3.6
1915	1,257,393	32,725	32,746	183	63	120	14.6	5.0	9.5	5.6	1.9	3.7
1916	1,284,779	34,455	34,455	173	74	99	13.5	5.8	7.7	5.0	2.1	2.9
1917	1,312,165	37,571	37,571	191	77	114	14.6	5.9	8.7	5.1	2.0	3.0
1918	1,339,552	37,216	37,216	277	55	222	20.7	4.1	16.6	7.4	1.5	6.0
1919	1,366,938	33,978	33,978	211	67	144	15.4	4.9	10.5	6.2	2.0	4.2
1920	1,394,324	34,096	34,096	232	76	156	16.6	5.5	11.2	6.8	2.2	4.6
1921	1,421,710	34,071	34,071	180	75	105	12.7	5.3	7.4	5.3	2.2	3.1
District of Columbia:												
1900	279,160	4,768	6,769	43	15	28	15.4	5.4	10.0	6.4	2.2	4.1
1901	284,461	4,355	6,238	67	30	37	23.6	10.5	13.0	10.7	4.8	5.9
1902	289,763	4,932	6,623	44	17	27	15.2	5.9	9.3	6.6	2.6	4.1
1903	295,065	5,124	6,543	53	27	26	18.0	9.2	8.8	8.1	4.1	4.0
1904	300,366	6,218	7,421	53	24	29	17.6	8.0	9.7	7.1	3.2	3.9
1905	305,668	6,415	7,256	54	19	35	17.7	6.2	11.5	7.4	2.6	4.8
1906	310,969	6,529	7,030	53	24	29	17.0	7.7	9.3	7.5	3.4	4.1
1907	316,271	6,873	7,300	53	23	30	16.8	7.3	9.5	7.3	3.2	4.1
1908	321,573	7,040	7,392	57	15	42	17.7	4.7	13.1	7.7	2.0	5.7
1909	326,874	7,026	7,343	56	25	31	17.1	7.6	9.5	7.6	3.4	4.2
1910	333,355	7,031	7,389	70	40	30	21.0	12.0	9.0	9.5	5.4	4.1
1911	344,326	7,032	7,415	57	25	32	16.6	7.3	9.3	7.7	3.4	4.3
1912	355,296	7,007	7,392	48	15	33	13.5	4.2	9.3	6.5	2.0	4.5
1913	366,266	6,903	7,323	63	24	39	17.2	6.6	10.6	8.6	3.3	5.3
1914	377,236	7,130	7,565	57	28	29	15.1	7.4	7.7	7.5	3.7	3.8
1915	388,206	7,067	7,441	49	27	22	12.6	7.0	5.7	6.6	3.6	3.0
1916	399,176	7,258	7,423	73	29	44	18.3	7.3	11.0	9.8	3.9	5.9
1917	410,146	7,519	7,519	64	28	36	15.6	6.8	8.8	8.5	3.7	4.8
1918	421,116	8,221	8,221	74	25	49	17.6	5.9	11.6	9.0	3.0	6.0
1919	432,085	8,231	8,231	70	22	48	16.2	5.1	11.1	8.5	2.7	5.8
1920	[2] 437,571	8,823	8,823	78	25	53	17.8	5.7	12.1	8.8	2.8	6.0
1921	[2] 437,571	8,987	8,987	91	30	61	20.8	6.9	13.9	10.1	3.3	6.8
Indiana:												
1900	2,518,018	41,573	66,257	263	122	141	10.4	4.8	5.6	4.0	1.8	2.1
1901	2,536,693	41,724	62,834	259	126	133	10.2	5.0	5.2	4.1	2.0	2.1
1902	2,555,367	43,262	62,905	230	97	133	9.0	3.8	5.2	3.7	1.5	2.1
1903	2,574,041	44,116	63,324	270	140	130	10.5	5.4	5.1	4.3	2.2	2.1
1904	2,592,716	42,756	60,323	318	151	167	12.3	5.8	6.4	5.3	2.5	2.8
1905	2,611,390	44,114	60,552	320	171	149	12.3	6.5	5.7	5.3	2.8	2.5
1906	2,630,065	45,300	58,875	294	127	167	11.2	4.8	6.3	5.0	2.2	2.8
1907	2,648,739	49,112	60,778	353	187	166	13.3	7.1	6.3	5.8	3.1	2.7
1908	2,667,413	56,713	67,168	351	164	187	13.2	6.1	7.0	5.2	2.4	2.8
1909	2,686,088	54,445	61,970	390	194	196	14.5	7.2	7.3	6.3	3.1	3.2
1910	2,705,801	56,309	62,354	449	237	212	16.6	8.8	7.8	7.2	3.8	3.4
1911	2,729,442	56,970	62,733	481	296	185	17.6	10.8	6.8	7.7	4.7	2.9
1912	2,753,084	57,855	62,276	452	239	213	16.4	8.7	7.7	7.3	3.8	3.4
1913	2,776,725	59,180	62,745	418	220	198	15.1	7.9	7.1	6.7	3.5	3.2
1914	2,800,366	61,889	64,503	457	239	218	16.3	8.5	7.8	7.1	3.7	3.4
1915	2,824,007	61,850	63,594	408	198	210	14.4	7.0	7.4	6.4	3.1	3.3
1916	2,847,648	63,312	64,261	457	231	226	16.0	8.1	7.9	7.1	3.6	3.5
1917	2,871,289	63,073	64,130	458	226	232	16.0	7.9	8.1	7.1	3.5	3.6

[1] See note 3, p. 51, for method of estimation. For the separate States the births were modified by multiplying by a factor found by dividing the actual registered births in 1917 by the estimated number. In years in which the registered births exceeded the estimated, the registered births were used.

[2] Population Jan. 1, 1920; no estimate made.

GENERAL TABLE 3.—*Maternal mortality rates, by cause of death; District of Columbia and each State included in the death-registration area of 1900, 1900–1921*—Continued

State and year	Estimated population, July 1	Registered live births from State reports	Estimated live births	Deaths from puerperal causes								
				Number			Rate per 100,000 population			Rate per 1,000 live births		
				Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
Indiana—Con.												
1918	2,894,930	64,313	65,684	669	268	401	23.1	9.3	13.9	10.2	4.1	6.1
1919	2,918,570	59,273	59,828	499	213	286	17.1	7.3	9.8	8.3	3.6	4.8
1920	2,942,210	64,809	65,454	567	260	307	19.3	8.8	10.4	8.7	4.0	4.7
1921	2,965,851	68,247	68,899	468	232	236	15.8	7.8	8.0	6.8	3.4	3.4
Maine:												
1900	694,870	14,905	15,965	65	21	44	9.4	3.0	6.3	4.1	1.3	2.8
1901	699,722	14,021	15,161	77	29	48	11.0	4.1	6.9	5.1	1.9	3.2
1902	704,574	14,508	15,663	107	43	64	15.2	6.1	9.1	6.8	2.7	4.1
1903	709,425	14,453	15,849	93	28	65	13.1	3.9	9.2	5.9	1.8	4.1
1904	714,277	14,673	15,690	91	38	53	12.7	5.3	7.4	5.8	2.4	3.4
1905	719,128	15,294	16,267	84	37	47	11.7	5.1	6.5	5.2	2.3	2.9
1906	723,980	15,878	16,619	73	17	56	10.1	2.3	7.7	4.4	1.0	3.4
1907	728,832	15,914	16,532	79	31	48	10.8	4.3	6.6	4.8	1.9	2.9
1908	733,683	16,173	16,719	82	30	52	11.2	4.1	7.1	4.9	1.8	3.1
1909	738,535	16,041	16,664	78	34	44	10.6	4.6	6.0	4.7	2.0	2.6
1910	742,922	15,798	16,437	110	46	64	14.8	6.2	8.6	6.7	2.8	3.9
1911	745,563	15,635	16,424	100	29	71	13.4	3.9	9.5	6.1	1.8	4.3
1912	748,205	15,869	16,717	76	21	55	10.2	2.8	7.4	4.5	1.3	3.3
1913	750,846	15,719	16,413	86	28	58	11.5	3.7	7.7	5.2	1.7	3.5
1914	753,487	15,980	16,660	87	29	58	11.5	3.8	7.7	5.2	1.7	3.5
1915	756,128	16,671	17,318	110	34	76	14.5	4.5	10.1	6.4	2.0	4.4
1916	758,769	16,033	16,456	125	31	94	16.5	4.1	12.4	7.6	1.9	5.7
1917	761,410	16,651	17,091	112	30	82	14.7	3.9	10.8	6.6	1.8	4.8
1918	764,051	16,798	16,896	144	21	123	18.8	2.7	16.1	8.5	1.2	7.3
1919	766,693	15,496	15,496	133	30	103	17.3	3.9	13.4	8.6	1.9	6.6
1920	769,334	17,328	17,328	147	27	120	19.1	3.5	15.6	8.5	1.6	6.9
1921	771,976	17,712	17,712	131	34	97	17.0	4.4	12.6	7.4	1.9	5.5
Massachusetts:												
1900	2,810,081	73,386	75,197	312	105	207	11.1	3.7	7.4	4.1	1.4	2.8
1901	2,866,898	71,976	74,806	267	92	175	9.3	3.2	6.1	3.6	1.2	2.3
1902	2,923,716	72,219	75,241	274	89	185	9.4	3.0	6.3	3.6	1.2	2.5
1903	2,980,534	73,584	77,501	341	116	225	11.4	3.9	7.5	4.4	1.5	2.9
1904	3,037,351	75,014	78,492	394	133	261	13.0	4.4	8.6	5.0	1.7	3.3
1905	3,094,169	75,022	77,113	359	120	239	11.6	3.9	7.7	4.7	1.6	3.1
1906	3,150,986	80,237	80,929	385	122	263	12.2	3.9	8.3	4.8	1.5	3.2
1907	3,207,804	85,001	85,123	404	137	267	12.6	4.3	8.3	4.7	1.6	3.1
1908	3,264,622	86,911	86,911	355	131	224	10.9	4.0	6.9	4.1	1.5	2.6
1909	3,321,439	84,039	84,039	482	170	312	14.5	5.1	9.4	5.7	2.0	3.7
1910	3,376,844	86,539	86,539	412	166	246	12.2	4.9	7.3	4.8	1.9	2.8
1911	3,426,897	88,327	88,327	510	210	300	14.9	6.1	8.8	5.8	2.4	3.4
1912	3,476,952	89,882	89,882	456	184	272	13.1	5.3	7.8	5.1	2.0	3.0
1913	3,527,007	91,644	91,644	510	187	323	14.5	5.3	9.2	5.6	2.0	3.5
1914	3,577,060	93,399	93,399	571	193	378	16.0	5.4	10.6	6.1	2.1	4.0
1915	3,627,114	93,155	93,155	533	155	378	14.7	4.3	10.4	5.7	1.7	4.1
1916	3,677,168	93,487	93,487	559	228	331	15.2	6.2	9.0	6.0	2.4	3.5
1917	3,727,221	95,731	95,731	622	261	361	16.7	7.0	9.7	6.5	2.7	3.8
1918	3,777,275	95,607	95,607	882	204	678	23.4	5.4	17.9	9.2	2.1	7.1
1919	3,827,329	87,827	87,827	619	180	439	16.2	4.7	11.5	7.0	2.0	5.0
1920	3,877,382	91,859	91,859	684	219	465	17.6	5.6	12.0	7.4	2.4	5.1
1921	3,927,436	92,245	92,245	601	200	401	15.3	5.1	10.2	6.5	2.2	4.3
Michigan:												
1900	2,424,266	42,580	61,249	449	214	235	18.5	8.8	9.7	7.3	3.5	3.8
1901	2,463,678	42,115	60,793	465	222	243	18.9	9.0	9.9	7.6	3.7	4.0
1902	2,503,090	44,380	63,471	447	190	257	17.9	7.6	10.3	7.0	3.0	4.0
1903	2,542,501	44,842	64,152	417	184	233	16.4	7.2	9.2	6.5	2.9	3.6
1904	2,581,913	45,880	62,475	502	218	284	19.4	8.4	11.0	8.0	3.5	4.5
1905	2,621,324	45,773	59,933	381	160	221	14.5	6.1	8.4	6.4	2.7	3.7
1906	2,660,736	57,099	70,750	428	169	259	16.1	6.4	9.7	6.0	2.4	3.7
1907	2,700,148	57,518	68,047	421	172	249	15.6	6.4	9.2	6.2	2.5	3.7
1908	2,739,559	63,114	72,186	460	187	273	16.8	6.8	10.0	6.4	2.6	3.8
1909	2,778,971	62,677	71,986	417	191	226	15.0	6.9	8.1	5.8	2.7	3.1
1910	2,828,590	64,109	73,224	474	196	278	16.8	6.9	9.8	6.5	2.7	3.8
1911	2,916,992	65,756	74,586	503	244	259	17.2	8.4	8.9	6.7	3.3	3.5
1912	3,005,394	69,537	77,727	425	179	246	14.1	6.0	8.2	5.5	2.3	3.2
1913	3,093,797	73,058	80,123	578	273	305	18.7	8.8	9.9	7.2	3.4	3.8
1914	3,182,199	76,761	81,876	528	227	301	16.6	7.1	9.5	6.4	2.8	3.7
1915	3,270,601	81,100	84,674	538	204	334	16.4	6.2	10.2	6.4	2.4	3.9
1916	3,359,003	87,062	89,462	592	269	323	17.6	8.0	9.6	6.6	3.0	3.6

GENERAL TABLE 3.—*Maternal mortality rates, by cause of death; District of Columbia and each State included in the death-registration area of 1900, 1900–1921*—Continued

State and year	Estimated population, July 1	Registered live births from State reports	Estimated live births	Deaths from puerperal causes								
				Number			Rate per 100,000 population			Rate per 1,000 live births		
				Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
Michigan—Con.												
1917	3,447,405	89,419	92,829	662	291	371	19.2	8.4	10.8	7.1	3.1	4.0
1918	3,535,808	91,261	95,005	782	236	546	22.1	6.7	15.4	8.2	2.5	5.7
1919	3,624,211	84,062	88,215	648	248	400	17.9	6.8	11.0	7.3	2.8	4.5
1920	3,712,613	92,245	99,864	864	314	550	23.3	8.5	14.8	8.7	3.2	5.5
1921	3,801,016	96,322	106,506	660	295	365	17.4	7.8	9.6	6.2	2.8	3.4
New Hampshire:												
1900	411,748	8,425	9,294	33	10	23	8.0	2.4	5.6	3.6	1.1	2.5
1901	413,671	8,164	9,058	29	13	16	7.0	3.1	3.9	3.2	1.4	1.8
1902	415,593	8,249	9,155	28	11	17	6.7	2.6	4.1	3.1	1.2	1.9
1903	417,515	8,318	9,204	44	16	28	10.5	3.8	6.7	4.8	1.7	3.0
1904	419,438	8,364	9,080	38	14	24	9.1	3.3	5.7	4.2	1.5	2.6
1905	421,360	8,782	9,399	53	14	39	12.6	3.3	9.3	5.6	1.5	4.1
1906	423,283	9,234	9,733	63	21	42	14.9	5.0	9.9	6.5	2.2	4.3
1907	425,205	9,083	9,503	45	13	32	10.6	3.1	7.5	4.7	1.4	3.4
1908	427,127	9,270	9,576	43	10	33	10.1	2.3	7.7	4.5	1.0	3.4
1909	429,050	8,913	9,259	56	19	37	13.1	4.4	8.6	6.0	2.1	4.0
1910	430,841	9,386	9,748	52	18	34	12.1	4.2	7.9	5.3	1.8	3.5
1911	432,129	8,993	9,356	59	18	41	13.7	4.2	9.5	6.3	1.9	4.4
1912	433,417	9,133	9,382	66	22	44	15.2	5.1	10.2	7.0	2.3	4.7
1913	434,706	9,236	9,378	59	18	41	13.6	4.1	9.4	6.3	1.9	4.4
1914	435,995	9,531	9,543	69	24	45	15.8	5.5	10.3	7.2	2.5	4.7
1915	437,284	10,003	10,003	61	19	42	13.9	4.3	9.6	6.1	1.9	4.2
1916	438,573	9,665	9,665	70	21	49	16.0	4.8	11.2	7.2	2.2	5.1
1917	439,861	9,564	9,564	67	20	47	15.2	4.5	10.7	7.0	2.1	4.9
1918	441,150	9,635	9,635	75	16	59	17.0	3.6	13.4	7.8	1.7	6.1
1919	442,439	8,852	8,852	70	17	53	15.8	3.8	12.0	7.9	1.9	6.0
1920	443,728	9,974	9,974	71	13	58	16.0	2.9	13.1	7.1	1.3	5.8
1921	445,016	10,125	10,125	63	17	46	14.2	3.8	10.3	6.2	1.7	4.5
New Jersey:												
1900	1,889,184	32,270	51,395	241	93	148	12.8	4.9	7.8	4.7	1.8	2.9
1901	1,955,361	34,812	55,062	192	74	118	9.8	3.8	6.0	3.5	1.3	2.1
1902	2,021,539	35,116	53,887	219	95	124	10.8	4.7	6.1	4.1	1.8	2.3
1903	2,087,717	37,242	56,254	235	94	141	11.3	4.5	6.8	4.2	1.7	2.5
1904	2,153,894	38,751	57,625	265	131	134	12.3	6.1	6.2	4.6	2.3	2.3
1905	2,220,072	39,689	57,715	285	134	151	12.8	6.0	6.8	4.9	2.3	2.6
1906	2,286,249	42,677	60,645	325	139	186	14.2	6.1	8.1	5.4	2.3	3.1
1907	2,352,427	44,651	62,464	302	121	181	12.8	5.1	7.7	4.8	1.9	2.9
1908	2,418,605	47,405	63,672	348	169	179	14.4	7.0	7.4	5.5	2.7	2.8
1909	2,484,782	47,508	61,177	313	141	172	12.6	5.7	6.9	5.1	2.3	2.8
1910	2,550,445	53,942	66,838	397	191	206	15.6	7.5	8.1	5.9	2.9	3.1
1911	2,614,177	58,133	69,897	424	202	222	16.2	7.7	8.5	6.1	2.9	3.2
1912	2,677,909	60,073	69,281	409	163	246	15.3	6.1	9.2	5.9	2.4	3.6
1913	2,741,642	61,432	69,445	446	215	231	16.3	7.8	8.4	6.4	3.1	3.3
1914	2,805,374	65,403	72,682	416	183	233	14.8	6.5	8.3	5.7	2.5	3.2
1915	2,869,106	66,476	72,092	419	181	238	14.6	6.3	8.3	5.8	2.5	3.3
1916	2,932,838	70,211	74,831	414	185	229	14.1	6.3	7.8	5.5	2.5	3.1
1917	2,996,569	75,309	80,632	433	167	266	14.4	5.6	8.9	5.4	2.1	3.3
1918	3,060,301	74,549	79,305	575	169	406	18.8	5.5	13.3	7.3	2.1	5.1
1919	3,124,034	70,935	80,999	426	138	288	13.6	4.4	9.2	5.3	1.7	3.6
1920	3,187,767	76,431	82,728	512	193	319	16.1	6.1	10.0	6.2	2.3	3.9
1921	3,251,499	78,172	84,497	458	190	268	14.1	5.8	8.2	5.4	2.2	3.2
New York:												
1900	7,284,461	143,156	199,102	1,023	470	553	14.0	6.5	7.6	5.1	2.4	2.8
1901	7,471,269	140,539	193,209	1,121	457	664	15.0	6.1	8.9	5.8	2.4	3.4
1902	7,658,077	146,740	197,377	1,039	457	582	13.6	6.0	7.6	5.3	2.3	2.9
1903	7,844,884	158,343	198,329	1,084	466	618	13.8	5.9	7.9	5.5	2.3	3.1
1904	8,031,692	165,014	210,258	1,268	577	691	15.8	7.2	8.6	6.0	2.7	3.3
1905	8,218,499	172,259	210,794	1,365	630	735	16.6	7.7	8.9	6.5	3.0	3.5
1906	8,405,307	183,012	216,722	1,323	579	744	15.7	6.9	8.9	6.1	2.7	3.4
1907	8,592,115	196,020	226,888	1,455	658	797	16.9	7.7	9.3	6.4	2.9	3.5
1908	8,778,922	203,159	227,230	1,367	626	741	15.6	7.1	8.4	6.0	2.8	3.3
1909	8,965,730	202,656	219,579	1,337	563	774	14.9	6.3	8.6	6.1	2.6	3.5
1910	9,140,901	213,235	225,867	1,386	616	770	15.2	6.7	8.4	6.1	2.7	3.4
1911	9,271,883	221,678	231,677	1,405	622	783	15.2	6.7	8.4	6.1	2.7	3.4
1912	9,402,864	227,120	231,593	1,290	567	723	13.7	6.0	7.7	5.6	2.4	3.1
1913	9,533,845	228,713	229,054	1,358	600	758	14.2	6.3	8.0	5.9	2.6	3.3
1914	9,664,826	240,038	240,038	1,442	656	786	14.9	6.8	8.1	6.0	2.7	3.3

GENERAL TABLE 3.—*Maternal mortality rates, by cause of death; District of Columbia and each State included in the death-registration area of 1900, 1900–1921*—Continued

State and year	Estimated population, July 1	Registered live births from State reports	Estimated live births	Deaths from puerperal causes								
				Number			Rate per 100,000 population			Rate per 1,000 live births		
				Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
New York—Continued.												
1915	9,795,808	242,950	242,950	1,418	628	790	14.5	6.4	8.1	5.8	2.6	3.3
1916	9,926,790	240,817	240,817	1,310	526	784	13.2	5.3	7.9	5.4	2.2	3.3
1917	10,057,772	246,453	246,453	1,413	568	845	14.0	5.6	8.4	5.7	2.3	3.4
1918	10,188,754	242,704	242,704	1,931	499	1,432	19.0	4.9	14.1	8.0	2.1	5.9
1919	10,319,736	226,269	226,269	1,412	483	929	13.7	4.7	9.0	6.2	2.1	4.1
1920	10,450,718	235,243	235,243	1,616	530	1,086	15.5	5.1	10.4	6.9	2.3	4.6
1921	10,581,700	239,875	239,875	1,504	596	908	14.2	5.6	8.6	6.3	2.5	3.8
Rhode Island:												
1900	429,519	11,084	11,516	89	36	53	20.7	8.4	12.3	7.7	3.1	4.6
1901	441,068	11,292	11,709	83	30	53	18.8	6.8	12.0	7.1	2.6	4.5
1902	452,618	11,227	11,602	71	32	39	15.7	7.1	8.6	6.1	2.8	3.4
1903	464,168	11,781	12,163	62	27	35	13.4	5.8	7.5	5.1	2.2	2.9
1904	475,718	12,076	12,425	97	50	47	20.4	10.5	9.9	7.8	4.0	3.8
1905	487,268	12,305	12,503	100	43	57	20.5	8.8	11.7	8.0	3.4	4.6
1906	498,818	12,677	12,828	88	34	54	17.6	6.8	10.8	6.9	2.7	4.2
1907	510,368	13,188	13,441	99	41	58	19.4	8.0	11.4	7.4	3.1	4.3
1908	521,918	13,279	13,462	87	31	56	16.7	5.9	10.7	6.5	2.3	4.2
1909	533,468	12,870	13,008	82	39	43	15.4	7.3	8.1	6.3	3.0	3.3
1910	543,936	13,354	13,552	82	27	55	15.1	5.0	10.1	6.1	2.0	4.1
1911	550,300	13,503	13,782	89	29	60	16.2	5.3	10.9	6.5	2.1	4.4
1912	556,664	13,594	13,731	80	29	51	14.4	5.2	9.2	5.8	2.1	3.7
1913	563,028	13,905	14,080	73	23	50	13.0	4.1	8.9	5.2	1.6	3.6
1914	569,392	14,484	14,614	80	22	58	14.1	3.9	10.2	5.5	1.5	4.0
1915	575,756	13,987	13,987	92	26	66	16.0	4.5	11.5	6.6	1.9	4.7
1916	582,120	14,622	14,622	85	21	64	14.6	3.6	11.0	5.8	1.4	4.4
1917	588,485	15,248	15,248	97	36	61	16.5	6.1	10.4	6.4	2.4	4.0
1918	594,850	15,547	15,547	152	33	119	25.6	5.5	20.0	9.8	2.1	7.7
1919	601,215	14,360	14,360	97	29	68	16.1	4.8	11.3	6.8	2.0	4.7
1920	607,580	15,197	15,197	120	34	86	19.8	5.6	14.2	7.9	2.2	5.7
1921	613,944	14,499	14,499	103	46	57	16.8	7.5	9.3	7.1	3.2	3.9
Vermont:												
1900	343,745	7,047	7,465	46	17	29	13.4	4.9	8.4	6.2	2.3	3.9
1901	344,992	6,973	7,416	33	10	23	9.6	2.9	6.7	4.4	1.3	3.1
1902	346,239	7,239	7,706	39	13	26	11.3	3.8	7.5	5.1	1.7	3.4
1903	347,485	7,182	7,607	51	12	39	14.7	3.5	11.2	6.7	1.6	5.1
1904	348,732	7,366	7,717	59	19	40	16.9	5.4	11.5	7.6	2.5	5.2
1905	349,979	7,378	7,699	66	15	51	18.9	4.3	14.6	8.6	1.9	6.6
1906	351,226	7,520	7,773	56	14	42	15.9	4.0	12.0	7.2	1.8	5.4
1907	352,473	7,550	7,793	95	25	70	27.0	7.1	19.9	12.2	3.2	9.0
1908	353,719	7,694	7,932	67	22	45	18.9	6.2	12.7	8.4	2.8	5.7
1909	354,966	7,587	7,849	67	32	35	18.9	9.0	9.9	8.5	4.1	4.5
1910	355,880	7,356	7,593	61	22	39	17.1	6.2	11.0	8.0	2.9	5.1
1911	355,517	7,263	7,537	49	16	33	13.8	4.5	9.3	6.5	2.1	4.4
1912	355,154	7,547	7,841	49	8	41	13.8	2.3	11.5	6.2	1.0	5.2
1913	354,791	7,477	7,643	55	17	38	15.5	4.8	10.7	7.2	2.2	5.0
1914	354,428	7,512	7,560	71	24	47	20.0	6.8	13.3	9.4	3.2	6.2
1915	354,065	7,875	7,905	48	12	36	13.6	3.4	10.2	6.1	1.5	4.6
1916	353,702	7,805	7,806	61	5	56	17.2	1.4	15.8	7.8	.6	7.2
1917	353,338	7,574	7,640	48	15	33	13.6	4.2	9.3	6.3	2.0	4.3
1918	352,974	7,564	7,698	60	10	50	17.0	2.8	14.2	7.8	1.3	6.5
1919	352,610	7,091	7,170	56	12	44	15.9	3.4	12.5	7.8	1.7	6.1
1920	[1] 352,428	7,500	7,577	52	14	38	14.8	4.0	10.8	6.9	1.8	5.0
1921	[1] 352,428	7,977	8,100	58	20	38	16.5	5.7	10.8	7.2	2.5	4.7

[1] Population Jan. 1, 1920; no estimate made.

GENERAL TABLE 4.—*Proportion of deaths from ill-defined and unknown causes, by States, 1921* [1]

State	Per cent of deaths due to unknown or ill-defined diseases	Death rate per 100,000 population from unknown or ill-defined diseases	State	Per cent of deaths due to unknown or ill-defined diseases	Death rate per 100,000 population from unknown or ill-defined diseases
United States death-registration area	1.4	16.0	Missouri	1.2	12.6
California	.1	1.8	Montana	1.7	13.7
Colorado	.2	2.6	Nebraska	1.2	11.3
Connecticut	.3	3.2	New Hampshire	.3	4.7
Delaware	.4	5.7	New Jersey	.2	2.0
District of Columbia	.1	1.4	New York	.1	1.2
Florida	5.3	62.7	North Carolina	9.8	110.2
Illinois	.2	2.2	Ohio	.5	5.3
Indiana	.2	1.9	Oregon	.7	6.9
Kansas	1.2	12.1	Pennsylvania	.4	4.8
Kentucky	1.9	19.5	Rhode Island	.6	7.2
Louisiana	3.0	33.6	South Carolina	4.5	54.0
Maine	1.2	17.1	Tennessee	6.5	69.0
Maryland	.9	11.6	Utah	2.3	24.3
Massachusetts	.3	4.2	Vermont	.2	2.8
Michigan	.6	7.1	Virginia	3.6	43.7
Minnesota	.7	6.3	Washington	.9	8.5
Mississippi	10.5	117.3	Wisconsin	.4	4.3

[1] Mortality Statistics, 1921, pp. 93–94. U. S. Bureau of the Census.

GENERAL TABLE 5.—*Estimated additions to puerperal deaths in original death-registration States of 1900 from ill-defined and unknown causes and from five poorly defined causes,*[1] *1900–1920*

Year	Deaths from puerperal causes															
	Puerperal septicemia								All other puerperal causes							
	Actual deaths in death-registration area	Estimated transfers classed to septicemia and peritonitis	Estimated deaths		Actual deaths from puerperal septicemia in original death-registration States	Estimated deaths from puerperal septicemia in original death-registration States [2]	Estimated transfers classed to ill-defined and unknown causes [3]	Estimated total in original death-registration States [4]	Actual deaths in death-registration area	Estimated transfers classed to convulsions, acute nephritis, and Bright's disease	Estimated deaths		Actual deaths from all other puerperal causes in original death-registration States	Estimated deaths from all other puerperal causes in original death-registration States [5]	Estimated transfers classed to ill-defined and unknown causes [3]	Estimated total in original death-registration States
			Number	Ratio to actual deaths							Number	Ratio to actual deaths				
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
1900	1,769	1,549	3,318	1.88	1,155	2,166	22	2,188	2,337	942	3,279	1.40	1,527	2,143	21	2,164
1901	1,882	1,220	3,102	1.65	1,124	1,853	17	1,870	2,412	878	3,290	1.36	1,580	2,155	17	2,172
1902	1,813	1,183	2,996	1.65	1,092	1,805	16	1,821	2,351	626	2,977	1.27	1,534	1,942	15	1,957
1903	1,992	1,041	3,033	1.52	1,153	1,756	14	1,770	2,577	455	3,032	1.18	1,625	1,912	14	1,926
1904	2,291	1,058	3,349	1.46	1,403	2,051	14	2,065	2,818	447	3,265	1.16	1,813	2,101	13	2,114
1905	2,309	949	3,258	1.41	1,401	1,977	13	1,990	2,768	630	3,398	1.23	1,818	2,232	14	2,246
1906	2,622	860	3,482	1.33	1,302	1,729	11	1,740	3,719	447	4,166	1.12	1,927	2,159	14	2,173
1907	2,908	795	3,703	1.27	1,476	1,880	10	1,890	3,811	454	4,265	1.12	1,972	2,207	11	2,218
1908	3,271	746	4,017	1.23	1,431	1,757	9	1,766	4,073	482	4,555	1.12	1,912	2,138	10	2,148
1909	3,427	466	3,893	1.14	1,453	1,651	7	1,658	4,364	696	5,060	1.16	1,969	2,283	9	2,292
1910	3,892	410	4,302	1.11	1,624	1,795	7	1,802	4,563	372	4,935	1.08	2,017	2,181	8	2,189
1911	4,376	399	4,775	1.09	1,748	1,907	2	1,909	5,080	455	5,535	1.09	2,058	2,242	3	2,245
1912	3,905	302	4,207	1.08	1,488	1,603	2	1,605	5,130	593	5,723	1.12	2,039	2,275	3	2,278
1913	4,542	186	4,728	1.04	1,661	1,729	2	1,731	5,468	542	6,010	1.10	2,128	2,339	2	2,341
1914	4,664	302	4,966	1.06	1,686	1,795	2	1,797	5,854	792	6,646	1.14	2,268	2,575	2	2,577
1915	4,214	188	4,402	1.04	1,547	1,616	2	1,618	6,023	941	6,964	1.16	2,312	2,673	2	2,675
1916	4,786	202	4,988	1.04	1,620	1,688	2	1,690	6,856	636	7,492	1.09	2,299	2,512	2	2,514
1917	5,211	289	5,500	1.06	1,719	1,814	2	1,816	7,317	298	7,615	1.04	2,448	2,548	2	2,550
1918	5,250	350	5,600	1.07	1,536	1,638	1	1,639	12,927	1,227	14,154	1.09	4,085	4,473	4	4,477
1919	4,950	234	5,184	1.05	1,439	1,507	1	1,508	9,538	1,030	10,568	1.11	2,802	3,105	2	3,107
1920	5,800	273	6,073	1.05	1,705	1,785	1	1,786	10,976	246	11,222	1.02	3,238	3,311	2	3,313

[1] (1) Septicemia, (2) peritonitis, (3) convulsions, (4) acute nephritis, and (5) Bright's disease

[2] Exclusive of transfers to ill-defined and unknown causes. Column F multiplied by ratio in column E.

[3] The estimated transfers from ill-defined and unknown causes calculated as described on p. 53 were distributed between puerperal septicemia and other puerperal causes in the proportion that these formed of the total puerperal deaths.

[4] Column G plus column H.

[5] Exclusive of transfers to ill-defined and unknown causes. Column N multiplied by ratio in column M.

GENERAL TABLE 6.—*Maternal mortality rates per 1,000 live births for urban and rural areas, United States birth-registration area as of 1915 (excluding Rhode Island) and United States expanding birth-registration area, 1915–1921* [1]

Year and area	Registered live births		Deaths from puerperal causes											
			Total				Puerperal septicemia				All other puerperal causes			
			Number		Rate per 1,000 live births		Number		Rate per 1,000 live births		Number		Rate per 1,000 live births	
	Cities	Rural	Cities	Rural	Cities	Rural	Cities	Rural	Cities	Rural	Cities	Rural	Cities	Rural
United States birth-registration area as of 1915 (excluding Rhode Island):														
1915	470,089	292,310	3,005	1,622	6.39	5.55	1,258	572	2.68	1.96	1,747	1,050	3.72	3.59
1916	479,628	291,090	3,108	1,683	6.48	5.78	1,381	572	2.88	1.97	1,727	1,111	3.60	3.82
1917	496,138	290,752	3,238	1,689	6.53	5.81	1,405	633	2.83	2.18	1,833	1,056	3.69	3.63
1918	493,949	290,048	4,477	2,490	9.06	8.58	1,246	557	2.52	1.92	3,231	1,933	6.54	6.66
1919	463,595	267,157	3,365	1,620	7.26	6.06	1,223	474	2.64	1.77	2,142	1,146	4.62	4.29
1920	503,524	270,124	4,002	1,891	7.95	7.00	1,416	566	2.81	2.10	2,586	1,325	5.14	4.91
1921	509,349	284,880	3,658	1,527	7.18	5.36	1,516	568	2.98	1.99	2,142	959	4.21	3.37
United States expanding birth-registration area:														
1915	481,496	294,808	3,088	1,631	6.41	5.53	1,283	573	2.66	1.94	1,805	1,058	3.75	3.59
1916	507,736	311,247	3,306	1,785	6.51	5.73	1,461	605	2.88	1.94	1,845	1,180	3.63	3.79
1917	682,158	671,634	4,773	4,185	7.00	6.23	2,136	1,544	3.13	2.30	2,637	2,641	3.87	3.93
1918	686,561	677,088	6,589	5,907	9.60	8.72	1,993	1,480	2.90	2.19	4,596	4,427	6.69	6.54
1919	677,503	695,935	5,336	4,791	7.88	6.88	1,986	1,380	2.93	1.98	3,350	3,411	4.94	4.90
1920	763,209	745,665	6,534	5,524	8.56	7.41	2,408	1,628	3.16	2.18	4,126	3,896	5.41	5.22
1921	852,519	861,742	6,571	5,117	7.71	5.94	2,805	1,834	3.29	2.13	3,766	3,283	4.42	3.81

[1] Compiled from Birth Statistics, 1915 to 1921, and Mortality Statistics, 1915 to 1921 (U. S. Bureau of the Census).

GENERAL TABLE 7.—*Proportion of physicians to population in certain countries*

Country	Year	Ratio of physicians to population (per 10,000)	Country	Year	Ratio of physicians to population (per 10,000)
Australia [1]	1911	8.77	New Zealand [10]	1921	8.79
Austria [2]	1913	4.68	Norway [11]	1918	5.02
Belgium [3]	1912	5.78	Scotland [12]	1911	6.78
Chile [4]	1907	3.08	Spain [13]	1900	18.18
Denmark [5]	1922	6.34	Sweden [14]	1921	2.79
England and Wales [6]	1923	5.91	Switzerland [15]	1917	6.83
France [7]	1911	5.73	The Netherlands [16]	1921	8.02
Germany [8]	1911	5.06	Uruguay [17]	1908	4.01
Ireland [6]	1923	14.96	United States [18]	1923	13.19
Italy [9]	1911	6.91			

[1] Official Year Book 1901–1918, p. 102, from the number of physicians as reported in the census of 1911; 731 classed as "irregular" have been deducted.
[2] Aerztliches Jahrbuch für Oesterreich, quoted in Wiener Klinische Wochenschrift, 1914, p. 30.
[3] Annuaire Statistique, 1913, p. 258.
[4] Census of 1907, pp. 1,262 and 1,300.
[5] Statistisk Årbok för Danmark, 1922, pp. 1, 25.
[6] Medical Register for 1923, p. lxxxvi.
[7] Resultats Statistiques du Recensement Général de la Population, 1911, Vol. I, Pt. 3, p. 63. Annuaire Statistique, 1912, p. 3.
[8] Reichsmedizinal Kalendar für Deutschland auf das Jahr 1912, Teil II, p. 754.
[9] Census of 1911, Part VIII.
[10] New Zealand Official Yearbook, 1923, pp. 51, 151.
[11] Sundhetstilstanden og Medisinalforholdene, 1918, p. 8.*
[12] Census of 1911; 3,228 physicians, surgeons, and registered practitioners; population, 4,760,904.
[13] Census of 1900, Vol. 4, p. 215, Vol. I, p. 331: 33,883 in the "medical professions" (a term which is not defined). Of this number 1,586 were women.
[14] Statistisk Årsbok, 1923, p. 57. (Population 1920, 5,847,037. Ibid., 1921, p. 3.)
[15] Statistisches Jahrbuch, 1920, p. 322. (Population 1920, 3,880,320. Ibid., p. 43.)
[16] Jaarcijfers voor het Koninkrijk der Nederlanden, Rijk in Europa, 1921, p. 37. 's-Gravenhage, 1923.
[17] Census of 1908, pp. VII, XXXVI.
[18] American Medical Directory for 1923, p. 8. Population estimated from censuses of 1910 and 1920.

GENERAL TABLE 8.—*Proportion of births attended by physicians and midwives in certain countries*

Country	Year	Per cent of births attended by—			Attendant not reported
		Physician	Midwife	Other or no attendant	
Australia [1]	1922	76.0	24.0	----	----
England [2]	1921	----	53.6	----	----
France [3]	1911–13	22.3	66.6	----	11.0
Norway [4]	1918	----	85.0	----	----
Scotland [5]	1922–23	----	37.0	----	----
Sweden [6]	1921	----	84.3	----	----
The Netherlands [7]	1916	38.5	58.9	2.7	----

[1] Compiled from Maternity Allowances, 1922 (Department of the Treasury, Commonwealth of Australia).
[2] Fourth Annual Report of the Ministry of Health (Great Britain), 1922–1923, p. 14; Cmd. 1944. Of 782,266 registered births in England, 419,655 were notified by midwives.
[3] Statistique du Mouvement de la Population, Années 1911, 1912, et 1913, pp. 140, 143. Paris, 1917. The percentages based upon cases with attendant reported were 74.9 per cent attended by physicians and 25.1 per cent attended by midwives.
[4] Sundhetstilstanden og Medisinalforholdene, Norges Offisielle Statistikk, 1918, pp. 21,* 36.* Of 64,187 confinements in 1918, 54,670 were attended by midwives.
[5] Report of the Central Midwives' Board for Scotland for the Year Ended Mar. 31, 1923, as abstracted in Nursing Notes and Midwives' Chronicles, December, 1923.
[6] Compiled from Allmän halso-och sjukvård, år 1921, av Kungl. Medicinalstyrelsen, p. 22 (Sveriges Officiella Statistik, Stockholm, 1923).
[7] Statistiek van den loop der bevolking in Nederland over het jaar 1916, p. 62–63. Bijdragen tot de Statistiek van Nederland, No. 248.

GENERAL TABLE 9.—*Scope and effect of system of querying unsatisfactorily certified causes of death in England and Wales, 1911–1921* [1]

Year	Total deaths	Queries sent		Replies received		Replies amplifying previous information	Deaths transferred to puerperal septicemia as result of inquiry [2]
		Number	Per cent of total deaths	Number	Per cent of total queries		
1911	527,810	12,563	2.4	10,718	85.3	8,196	50
1912	486,939	9,912	2.0	8,305	83.8	6,064	40
1913	504,975	8,552	1.7	7,575	88.6	5,495	29
1914	516,742	7,808	1.5	6,594	84.5	5,028	29
1915	562,253	6,869	1.2	5,951	86.6	4,917	28
1916	508,217	6,255	1.2	5,451	87.1	4,602	29
1917	498,922	6,046	1.2	5,350	88.5	4,686	7
1918	611,861	6,114	1.0	5,384	88.1	4,763	25
1919	504,203	5,980	1.2	5,320	89.0	4,538	23
1920	466,130	6,402	1.4	5,452	85.2	4,668	29
1921	438,629	6,222	1.4	5,399	86.8	4,743	16

[1] Compiled from annual reports of the Registrar-General of Births, Deaths, and Marriages in England and Wales.

[2] Includes only transfers from "pyemia, septicemia, etc.," and "peritonitis"; not stated whether any transfers were made from other causes to puerperal septicemia.

GENERAL TABLE 10.—*Live births, deaths, and death rates per 1,000 live births from diseases caused by pregnancy and confinement in certain foreign countries for specified years*

Country and year	Live births	Deaths from diseases caused by pregnancy and confinement					
		Number			Rate per 1,000 live births		
		Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
Australia:							
1905	104,941	616	205	411	5.9	2.0	3.9
1906	107,890	626	168	458	5.8	1.6	4.2
1907	110,347	614	179	435	5.6	1.6	3.9
1908	111,545	606	202	404	5.4	1.8	3.6
1909	114,071	577	201	376	5.1	1.8	3.3
1910	116,801	591	218	373	5.1	1.9	3.2
1911	122,193	615	209	406	5.0	1.7	3.3
1912	133,088	644	231	413	4.8	1.7	3.1
1913	135,714	663	235	428	4.9	1.7	3.2
1914	137,983	634	215	419	4.6	1.6	3.0
1915	134,871	576	182	394	4.3	1.3	2.9
1916	131,426	693	282	411	5.3	2.1	3.1
1917	129,965	732	250	482	5.6	1.9	3.7
1918	125,739	592	183	409	4.7	1.5	3.3
1919	122,290	570	166	404	4.7	1.4	3.3
1920	136,406	683	250	433	5.0	1.8	3.2
1921	136,198	643	208	435	4.7	1.5	3.2
1922	137,496	621	196	425	4.5	1.4	3.1
Belgium:							
1900	193,789	1,046	----	----	5.4	----	----
1901	200,077	1,055	----	----	5.3	----	----
1902	195,871	1,080	----	----	5.5	----	----
1903	192,301	1,205	432	773	6.3	2.2	4.0
1904	191,721	1,179	445	734	6.1	2.3	3.8
1905	187,437	995	389	606	5.3	2.1	3.2
1906	186,271	1,029	403	626	5.5	2.2	3.4
1907	185,138	1,053	407	646	5.7	2.2	3.5
1908	183,834	1,121	466	655	6.1	2.5	3.6
1909	176,431	1,039	439	600	5.9	2.5	3.4
1910	176,413	967	411	556	5.5	2.3	3.2
1911	171,802	1,024	398	626	6.0	2.3	3.6
1912	171,187	1,122	476	646	6.6	2.8	3.8
1913	171,099	950	389	561	5.6	2.3	3.3
1919	123,314	894	409	485	7.2	3.3	3.9
1920	163,738	997	429	568	6.1	2.6	3.5
1921	163,333	941	395	546	5.8	2.4	3.3

GENERAL TABLE 10.—*Live births, deaths, and death rates per 1,000 live births from diseases caused by pregnancy and confinement in certain foreign countries for specified years*—Continued

Country and year	Live births	Deaths from diseases caused by pregnancy and confinement					
		Number			Rate per 1,000 live births		
		Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
Chile:							
1910	130,052	1,131	233	898	8.7	1.8	6.9
1911	133,468	973	174	799	7.3	1.3	6.0
1912	135,373	965	185	780	7.1	1.4	5.8
1913	140,525	1,053	192	861	7.5	1.4	6.1
1914	136,550	987	183	804	7.2	1.3	5.9
1915	136,597	907	185	722	6.6	1.4	5.3
1916	144,193	1,051	234	817	7.3	1.6	5.7
1917	149,161	1,081	307	774	7.2	2.1	5.2
1918	145,871	1,197	291	906	8.2	2.0	6.2
1919	144,980	1,270	305	965	8.8	2.1	6.7
1920	146,725	1,098	307	791	7.5	2.1	5.4
1921	147,795	1,170	354	816	7.9	2.4	5.5
1922	147,205	1,177	320	857	8.0	2.2	5.8
Denmark:							
1920	78,230	184	105	79	2.4	1.3	1.0
1921	78,808	161	105	56	2.0	1.3	0.7
England and Wales:[1]							
1900	927,062	4,455	1,941	2,514	4.8	2.1	2.7
1901	929,807	4,394	2,005	2,389	4.7	2.2	2.6
1902	940,509	4,205	1,908	2,297	4.5	2.0	2.4
1903	948,271	3,857	1,581	2,276	4.1	1.7	2.4
1904	945,389	3,667	1,560	2,107	3.9	1.7	2.2
1905	929,293	3,905	1,631	2,274	4.2	1.8	2.4
1906	935,081	3,757	1,538	2,219	4.0	1.6	2.4
1907	918,042	3,520	1,381	2,139	3.8	1.5	2.3
1908	940,383	3,361	1,312	2,049	3.6	1.4	2.2
1909	914,472	3,379	1,357	2,022	3.7	1.5	2.2
1910	896,962	3,191	1,219	1,972	3.6	1.4	2.2
1911a	881,138	3,236	1,267	1,969	3.7	1.4	2.2
1912a	872,737	3,299	1,223	2,076	3.8	1.4	2.4
1913a	881,890	3,271	1,119	2,152	3.7	1.3	2.4
1914a	879,096	3,469	1,372	2,097	3.9	1.6	2.4
1915a	814,614	3,210	1,217	1,993	3.9	1.5	2.4
1916a	785,520	3,038	1,089	1,949	3.9	1.4	2.5
1917a	668,346	2,446	888	1,558	3.7	1.3	2.3
1918a	662,661	2,353	854	1,499	3.6	1.3	2.3
1919a	692,438	2,852	1,167	1,685	4.1	1.7	2.4
1920a	957,782	3,942	1,740	2,202	4.1	1.8	2.3
1921a	848,814	3,145	1,240	1,905	3.7	1.5	2.2
1911b	881,138	3,413	1,262	2,151	3.9	1.4	2.4
1912b	872,737	3,473	1,216	2,257	4.0	1.4	2.6
1913b	881,890	3,492	1,108	2,384	4.0	1.3	2.7
1914b	879,096	3,667	1,365	2,302	4.2	1.6	2.6
1915b	814,614	3,408	1,201	2,207	4.2	1.5	2.7
1916b	785,520	3,239	1,083	2,156	4.1	1.4	2.7
1917b	668,346	2,598	873	1,725	3.9	1.3	2.6
1918b	662,661	2,509	845	1,664	3.8	1.3	2.5
1919b	692,438	3,028	1,157	1,871	4.4	1.7	2.7
1920b	957,782	4,141	1,730	2,414	4.3	1.8	2.5
1921b	848,814	3,322	1,171	2,151	3.9	1.4	2.5
1922b	780,124	2,971	1,079	1,892	3.8	1.4	2.4
Finland:							
1900	86,339	427			4.9		
1901	88,637	407			4.6		
1902	87,082	421			4.8		
1903	85,120	355			4.2		
1904	90,253	408			4.5		
1905	87,841	374			4.3		
1906	91,401	368			4.0		
1907	92,457	370			4.0		
1908	92,146	359			3.9		
1909	95,005	395			4.2		
1910	92,984	346			3.7		
1911	91,238	388			4.3		
1912	92,275	342			3.7		
1913	87,250	343			3.9		
1914	87,577	360			4.1		
1915	83,306	284			3.4		

[1] From 1911 through 1922: *a*—according to classification of cause of death used in England and Wales prior to 1911; *b*—according to international classification of cause of death.

GENERAL TABLE 10.—*Live births, deaths, and death rates per 1,000 live births from diseases caused by pregnancy and confinement in certain foreign countries for specified years*—Continued

Country and year	Live births	Deaths from diseases caused by pregnancy and confinement					
		Number			Rate per 1,000 live births		
		Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
Finland—Continued.							
1916	79,653	290			3.6		
1917	81,046	307			3.8		
1918	79,494	352			4.4		
1919	63,896	256			4.0		
1920	84,714	305			3.6		
France:							
1906	806,847	4,067	1,873	2,194	5.0	2.3	2.7
1907	772,681	4,499	2,117	2,382	5.8	2.7	3.1
1908	792,178	3,982	1,855	2,127	5.0	2.3	2.7
1909	769,565	4,097	1,900	2,197	5.3	2.5	2.9
1910	774,390	3,572	1,679	1,893	4.6	2.2	2.4
1911	742,435	3,513	1,727	1,786	4.7	2.3	2.4
1912	750,379	3,756	1,850	1,906	5.0	2.5	2.5
1913	746,014	3,428	1,648	1,780	4.6	2.2	2.4
1914	594,222	3,410	1,624	1,786	5.7	2.7	3.0
1915	387,806	2,575	1,278	1,297	6.6	3.3	3.3
Germany:							
1901	2,032,313	6,668	3,011	3,657	3.3	1.5	1.8
1902	2,024,735	6,663	3,005	3,658	3.3	1.5	1.8
1903	1,983,078	6,843	3,294	3,549	3.5	1.7	1.8
1904	2,025,847	7,152	3,454	3,698	3.5	1.7	1.8
1905	1,987,153	6,802	3,081	3,721	3.4	1.6	1.9
1906	2,022,477	6,316	2,587	3,729	3.1	1.3	1.8
1907	1,999,933	6,326	2,675	3,651	3.2	1.3	1.8
1908	2,015,052	6,576	2,987	3,589	3.3	1.5	1.8
1909	1,978,278	6,595	3,041	3,554	3.3	1.5	1.8
1910	1,921,778	6,243	2,879	3,364	3.2	1.5	1.7
1911	1,870,729	6,584	3,219	3,365	3.5	1.7	1.8
1912	1,869,636	6,510	3,072	3,438	3.5	1.6	1.8
1913	1,838,748	6,314	2,981	3,333	3.4	1.6	1.8
1914	1,818,596	6,537	3,054	3,483	3.6	1.7	1.9
1915	1,382,546	5,493	2,687	2,806	4.0	1.9	2.0
1916	1,008,033	4,504	2,277	2,227	4.5	2.3	2.2
1917	912,109	4,139	2,091	2,048	4.5	2.3	2.2
1918	926,813	4,570	2,454	2,116	4.9	2.6	2.3
1919	1,260,500	6,485	3,603	2,882	5.1	2.9	2.3
Hungary:							
1900	752,718	2,606	636	1,970	3.5	.8	2.6
1901	731,721	2,789	687	2,102	3.8	.9	2.9
1902	759,739	2,665	622	2,043	3.5	.8	2.7
1903	725,239	2,562	571	1,991	3.5	.8	2.7
1904	740,799	2,678	654	2,024	3.6	.9	2.7
1905	720,532	2,694	689	2,005	3.7	1.0	2.8
1906	733,953	2,490	602	1,888	3.4	.8	2.6
1907	740,867	2,552	720	1,832	3.4	1.0	2.5
1908	755,888	2,892	889	2,003	3.8	1.2	2.6
1909	776,395	2,839	961	1,878	3.7	1.2	2.4
1910	742,899	2,506	793	1,713	3.4	1.1	2.3
1911	732,767	2,443	869	1,574	3.3	1.2	2.1
1912	765,891	2,529	902	1,627	3.3	1.2	2.1
1913	736,626	2,365	744	1,621	3.2	1.0	2.2
1914	746,911	2,470	764	1,706	3.3	1.0	2.3
1915	512,261	2,048	648	1,400	4.0	1.3	2.7
Ireland:							
1902	101,863	635	214	421	6.2	2.1	4.1
1903	101,831	573	222	351	5.6	2.2	3.4
1904	103,811	583	206	377	5.6	2.0	3.6
1905	102,832	573	217	356	5.6	2.1	3.5
1906	103,536	607	218	389	5.9	2.1	3.8
1907	101,742	505	152	353	5.0	1.5	3.5
1908	102,039	530	178	352	5.2	1.7	3.4
1909	102,759	561	207	354	5.5	2.0	3.4
1910	101,963	542	178	364	5.3	1.7	3.6
1911	101,758	514	165	349	5.1	1.6	3.4
1912	101,035	549	187	362	5.4	1.9	3.6
1913	100,094	527	163	364	5.3	1.6	3.6
1914	98,806	497	182	315	5.0	1.8	3.2
1915	95,583	515	172	343	5.4	1.8	3.6
1916	91,437	504	170	334	5.5	1.9	3.7
1917	86,370	426	130	296	4.9	1.5	3.4

GENERAL TABLE 10.—*Live births, deaths, and death rates per 1,000 live births from diseases caused by pregnancy and confinement in certain foreign countries for specified years*—Continued

Country and year	Live births	Deaths from diseases caused by pregnancy and confinement					
		Number			Rate per 1,000 live births		
		Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
Ireland—Continued.							
1918	87,304	419	139	280	4.8	1.6	3.2
1919	89,325	418	135	283	4.7	1.5	3.2
1920	99,536	550	225	325	5.5	2.3	3.3
1921	90,720	508	187	321	5.6	2.1	3.5
Italy:							
1900	1,067,376	3,034	1,033	2,001	2.8	1.0	1.9
1901	1,057,763	2,767	994	1,773	2.6	.9	1.7
1902	1,093,074	2,807	1,037	1,770	2.6	.9	1.6
1903	1,042,090	2,771	1,112	1,659	2.7	1.1	1.6
1901	1,085,431	2,981	1,082	1,899	2.7	1.0	1.7
1905	1,084,518	3,198	977	2,221	2.9	.9	2.0
1906	1,070,978	2,791	1,021	1,770	2.6	1.0	1.7
1907	1,062,333	3,074	1,147	1,927	2.9	1.1	1.8
1908	1,138,813	3,315	1,245	2,070	2.9	1.1	1.8
1909	1,115,831	3,127	1,242	1,885	2.8	1.1	1.7
1910	1,144,410	2,786	1,011	1,775	2.4	.9	1.6
1911	1,093,545	2,612	929	1,683	2.4	.8	1.5
1912	1,133,985	2,743	899	1,844	2.4	.8	1.6
1913	1,122,482	2,811	1,037	1,774	2.5	.9	1.6
1914	1,114,091	2,696	1,036	1,660	2.4	0.9	1.5
1915	1,109,183	2,477	877	1,600	2.2	0.8	1.4
1916	881,626	2,351	841	1,510	2.7	1.0	1.7
1917	691,207	2,041	779	1,262	3.0	1.1	1.8
1918	634,389	2,330	897	1,433	3.7	1.4	2.3
Japan:							
1900	1,420,534	6,200	1,679	4,521	4.4	1.2	3.2
1901	1,501,591	6,671	1,885	4,786	4.4	1.3	3.2
1902	1,510,835	6,556	1,983	4,573	4.3	1.3	3.0
1903	1,489,816	6,071	2,028	4,043	4.1	1.4	2.7
1904	1,440,371	5,742	1,810	3,932	4.0	1.3	2.7
1905	1,452,770	6,185	1,878	4,307	4.3	1.3	3.0
1906	1,394,295	6,237	1,915	4,322	4.5	1.4	3.1
1907	1,614,472	6,728	2,294	4,434	4.2	1.4	2.7
1908	1,662,815	7,091	2,570	4,521	4.3	1.5	2.7
1909	1,693,850	6,399	2,575	3,824	3.8	1.5	2.3
1910	1,712,857	6,228	2,556	3,672	3.6	1.5	2.1
1911	1,747,803	6,192	2,512	3,680	3.5	1.4	2.1
1912	1,737,674	5,770	2,357	3,413	3.3	1.4	2.0
1913	1,757,441	5,900	2,425	3,475	3.4	1.4	2.0
1914	1,808,402	6,418	2,762	3,656	3.5	1.5	2.0
1915	1,799,326	6,452	2,657	3,795	3.6	1.5	2.1
1916	1,804,822	6,337	2,468	3,869	3.5	1.4	2.1
1917	1,812,413	6,368	2,503	3,865	3.5	1.4	2.1
1918	1,791,992	6,812	2,558	4,254	3.8	1.4	2.4
1919	1,778,685	5,910	2,148	3,762	3.3	1.2	2.1
1920	2,025,564	7,158	2,698	4,460	3.5	1.3	2.2
1921	1,990,876	7,181	2,667	4,514	3.6	1.3	2.3
1922	1,969,314	6,565	2,280	4,285	3.3	1.2	2.2
The Netherlands:							
1900	162,611	458	144	314	2.8	.9	1.9
1901	168,380	420	140	280	2.5	.8	1.7
1902	168,728	407	131	276	2.4	.8	1.6
1903	170,108	433	120	313	2.5	.7	1.8
1904	171,495	420	121	299	2.4	.7	1.7
1905	170,767	414	119	295	2.4	.7	1.7
1906	170,952	428	138	290	2.5	.8	1.7
1907	171,506	403	129	274	2.3	.8	1.6
1908	171,861	430	122	308	2.5	.7	1.8
1909	170,766	376	111	265	2.2	.7	1.6
1910	168,894	419	113	306	2.5	.7	1.8
1911	166,527	398	129	269	2.4	.8	1.6
1912	170,269	406	111	295	2.4	.7	1.7
1913	173,541	364	103	261	2.1	.6	1.5
1914	176,831	375	104	271	2.1	.6	1.5
1915	167,423	423	132	291	2.5	.8	1.7
1916	172,572	444	164	280	2.6	1.0	1.6
1917	173,112	438	137	301	2.5	.8	1.7
1918	167,636	498	169	329	3.0	1.0	2.0
1919	164,447	551	202	349	3.4	1.2	2.1
1920	192,987	467	162	305	2.4	.8	1.6

GENERAL TABLE 10.—*Live births, deaths, and death rates per 1,000 live births from diseases caused by pregnancy and confinement in certain foreign countries for specified years*—Continued

Country and year	Live births	Deaths from diseases caused by pregnancy and confinement					
		Number			Rate per 1,000 live births		
		Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
The Netherlands—Contd.							
1921	189,546	443	132	311	2.3	0.7	1.6
1922	181,886	454	132	322	2.5	.7	1.8
New Zealand:							
1900	19,546	75	24	51	3.8	1.2	2.6
1901	20,491	90	20	70	4.4	1.0	3.4
1902	20,655	110	25	85	5.3	1.2	4.1
1903	21,829	128	28	100	5.9	1.3	4.6
1904	22,766	106	21	85	4.7	.9	3.7
1905	23,682	100	21	79	4.2	.9	3.3
1906	24,252	94	18	76	3.9	.7	3.1
1907	25,094	116	29	87	4.6	1.2	3.5
1908	25,940	119	46	73	4.6	1.8	2.8
1909	26,524	135	33	102	5.1	1.2	3.8
1910	25,984	117	35	82	4.5	1.3	3.2
1911	26,354	114	27	87	4.3	1.0	3.3
1912	27,508	100	19	81	3.6	.7	2.9
1913	27,935	100	29	71	3.6	1.0	2.5
1914	28,338	118	35	83	4.2	1.2	2.9
1915	27,850	131	22	109	4.7	.8	3.9
1916	28,509	167	60	107	5.9	2.1	3.8
1917	28,239	169	59	110	6.0	2.1	3.9
1918	25,860	134	48	86	5.2	1.9	3.3
1919	24,483	124	52	72	5.1	2.1	2.9
1920	29,921	194	67	127	6.5	2.2	4.2
1921	28,567	145	48	97	5.1	1.7	3.4
1922	29,006	149	52	97	5.1	1.8	3.3
Norway:							
1900	66,229	184	111	73	2.8	1.7	1.1
1901	66,719	219	101	118	3.3	1.5	1.8
1902	65,916	207	109	98	3.1	1.7	1.5
1903	64,901	205	113	92	3.2	1.7	1.4
1904	63,586	199	106	93	3.1	1.7	1.5
1905	62,057	163	75	88	2.6	1.2	1.4
1906	61,553	152	78	74	2.5	1.3	1.2
1907	60,769	168	92	76	2.8	1.5	1.3
1908	61,151	183	98	85	3.0	1.6	1.4
1909	62,579	187	81	106	3.0	1.3	1.7
1910	61,147	165	77	88	2.7	1.3	1.4
1911	61,151	189	87	102	3.1	1.4	1.7
1912	61,937	185	90	95	3.0	1.5	1.5
1913	61,665	159	60	99	2.6	1.0	1.6
1914	62,223	206	71	135	3.3	1.1	2.2
1915	58,540	158	55	103	2.7	.9	1.8
1916	61,108	171	61	110	2.8	1.0	1.8
1917	63,915	189	82	107	3.0	1.3	1.7
1918	63,326	188	52	136	3.0	.8	2.1
1919	59,013	205	79	126	3.5	1.3	2.1
Scotland:							
1900	131,401	567	225	342	4.3	1.7	2.6
1901	132,192	627	280	347	4.7	2.1	2.6
1902	132,267	682	307	375	5.2	2.3	2.8
1903	133,525	709	291	418	5.3	2.2	3.1
1904	132,603	615	241	374	4.6	1.8	2.8
1905	131,410	718	248	470	5.5	1.9	3.6
1906	132,005	717	263	454	5.4	2.0	3.4
1907	128,840	686	228	458	5.3	1.8	3.6
1908	131,362	676	231	445	5.1	1.8	3.4
1909	128,669	699	212	487	5.4	1.6	3.8
1910	124,059	710	221	489	5.7	1.8	3.9
1911	121,850	699	173	526	5.7	1.4	4.3
1912	122,790	675	193	482	5.5	1.6	3.9
1913	120,516	708	160	548	5.9	1.3	4.5
1914	123,934	746	229	517	6.0	1.8	4.2
1915	114,181	698	221	477	6.1	1.9	4.2
1916	109,942	626	185	441	5.7	1.7	4.0
1917	97,441	574	165	409	5.9	1.7	4.2
1918	98,554	688	113	575	7.0	1.1	5.8
1919	106,268	661	150	511	6.2	1.4	4.8
1920	136,546	840	242	598	6.2	1.8	4.4
1921	123,201	786	250	536	6.4	2.0	4.4
1922	115,085	759	228	531	6.6	2.0	4.6

GENERAL TABLE 10.—*Live births, deaths, and death rates per 1,000 live births from diseases caused by pregnancy and confinement in certain foreign countries for specified years*—Continued

Country and year	Live births	Deaths from diseases caused by pregnancy and confinement					
		Number			Rate per 1,000 live births		
		Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
Spain:							
1900	627,848	3,557	1,811	1,746	5.7	2.9	2.8
1901	650,649	3,674	2,178	1,496	5.6	3.3	2.3
1902	666,687	3,494	2,116	1,378	5.2	3.2	2.1
1903	685,265	3,771	2,362	1,409	5.5	3.4	2.1
1904	649,878	3,885	2,465	1,420	6.0	3.8	2.2
1905	670,651	4,115	2,715	1,400	6.1	4.0	2.1
1906	650,385	3,860	2,469	1,391	5.9	3.8	2.1
1907	646,374	3,930	2,549	1,381	6.1	3.9	2.1
1908	657,701	3,725	2,316	1,409	5.7	3.5	2.1
1909	650,415	3,643	2,280	1,363	5.6	3.5	2.1
1910	646,975	3,407	2,107	1,300	5.3	3.3	2.0
1911	628,443	3,294	2,024	1,270	5.2	3.2	2.0
1912	637,860	3,392	2,135	1,257	5.3	3.3	2.0
1913	617,850	3,244	2,027	1,217	5.3	3.3	2.0
1914	608,207	3,211	1,953	1,258	5.3	3.2	2.1
1915	631,462	3,255	1,953	1,302	5.2	3.1	2.1
1916	599,011	3,085	1,825	1,260	5.2	3.0	2.1
1917	602,139	3,055	1,884	1,171	5.1	3.1	1.9
1918	612,637	3,896	2,535	1,361	6.4	4.1	2.2
1919	585,352	3,085	1,917	1,168	5.3	3.3	2.0
1920	622,468	3,120	1,931	1,189	5.0	3.1	1.9
1921	649,171	3,290	2,073	1,217	5.1	3.2	1.9
Sweden:							
1901	139,370	315	152	163	2.3	1.1	1.2
1902	137,364	306	146	160	2.2	1.1	1.2
1903	133,896	305	128	177	2.3	1.0	1.3
1904	134,952	288	126	162	2.1	.9	1.2
1905	135,409	333	169	164	2.5	1.2	1.2
1906	136,620	325	124	201	2.4	.9	1.5
1907	136,793	318	110	208	2.3	.8	1.5
1908	138,874	295	107	188	2.1	.8	1.4
1909	139,505	349	113	236	2.5	.8	1.7
1910	135,625	345	119	226	2.5	.9	1.7
1911	132,977	354	136	218	2.7	1.0	1.6
1912	132,868	309	125	184	2.3	.9	1.4
1913	130,200	296	135	161	2.3	1.0	1.2
1914	129,458	337	141	196	2.6	1.1	1.5
1915	122,997	357	153	201	2.9	1.2	1.7
1916	121,679	324	148	176	2.7	1.2	1.4
1917	120,855	297	136	161	2.5	1.1	1.3
1918	117,955	304	149	155	2.6	1.3	1.3
Switzerland:							
1900	94,316	523	193	330	5.5	2.0	3.5
1901	97,028	586	250	336	6.0	2.6	3.5
1902	96,481	500	196	304	5.2	2.0	3.2
1903	93,824	554	237	317	5.9	2.5	3.4
1904	94,867	590	257	333	6.2	2.7	3.5
1905	94,653	551	253	298	5.8	2.7	3.1
1906	95,595	495	191	304	5.2	2.0	3.2
1907	94,508	553	261	292	5.9	2.8	3.1
1908	96,245	554	227	327	5.8	2.4	3.4
1909	94,112	544	238	306	5.8	2.5	3.3
1910	93,514	447	182	265	4.8	1.9	2.8
1911	91,320	501	245	256	5.5	2.7	2.8
1912	92,196	484	218	266	5.2	2.4	2.9
1913	89,757	440	197	243	4.9	2.2	2.7
1914	87,330	467	188	279	5.3	2.2	3.2
1915	75,545	412	174	238	5.5	2.3	3.2
1916	73,660	----------	179	----------	----------	2.4	----------
1917	72,065	----------	204	----------	----------	2.8	----------
1918	72,658	----------	209	----------	----------	2.9	----------
1919	72,125	----------	196	----------	----------	2.7	----------
1920	81,190	----------	235	----------	----------	2.9	----------
Union of South Africa:							
1912	42,014	189	85	104	4.5	2.0	2.5
1913	42,138	190	87	103	4.5	2.1	2.4
1914	40,886	169	80	89	4.1	2.0	2.2
1915	40,471	161	63	98	4.0	1.6	2.4
1916	41,196	144	61	83	3.5	1.5	2.0
1917	40,722	177	67	110	4.3	1.6	2.7
1918	41,582	172	74	98	4.1	1.8	2.4
1919	39,724	154	51	103	3.9	1.3	2.6

GENERAL TABLE 10.—*Live births, deaths, and death rates per 1,000 live births from diseases caused by pregnancy and confinement in certain foreign countries for specified years*—Continued

Country and year	Live births	Deaths from diseases caused by pregnancy and confinement					
		Number			Rate per 1,000 live births		
		Total	Puerperal septicemia	All other	Total	Puerperal septicemia	All other
Union of South Africa—Con.							
1920	43,445	178	84	94	4.1	1.9	2.2
1921	43,302	178	69	109	4.1	1.6	2.5
Uruguay:							
1900	30,589	62	30	32	2.0	1.0	1.0
1901	31,703	71	28	43	2.2	.9	1.4
1902	31,526	77	35	42	2.4	1.1	1.3
1903	32,600	86	39	47	2.6	1.2	1.4
1904	26,984	65	37	28	2.4	1.4	1.0
1905	33,709	75	48	27	2.2	1.4	.8
1906	32,578	71	40	31	2.2	1.2	1.0
1907	33,657	86	56	30	2.6	1.7	.9
1908	35,520	72	51	21	2.0	1.4	.6
1909	35,663	83	45	38	2.3	1.3	1.1
1910	35,927	95	58	37	2.6	1.6	1.0
1911	37,530	69	41	28	1.8	1.1	.7
1912	39,171	104	57	47	2.7	1.5	1.2
1913	40,315	90	55	35	2.2	1.4	.9
1914	38,571	98	54	44	2.5	1.4	1.1
1915	38,046	85	49	36	2.2	1.3	.9
1916	36,983	106	69	37	2.9	1.9	1.0
1917	36,752	116	60	56	3.2	1.6	1.5
1918	38,914	116	69	47	3.0	1.8	1.2
1919	39,307	91	59	32	2.3	1.5	.8
1920	39,335	133	81	52	3.4	2.1	1.3
1921	39,611	129	76	53	3.3	1.9	1.3

GENERAL TABLE 11.—*Registered and estimated births and reported and adjusted puerperal deaths; United States birth-registration area, 1919*

States	Births		Puerperal deaths	
	Registered	Estimated [1]	Registered	Adjusted [2]
Birth-registration area	1,373,438	1,491,199	10,127	11,559
California	56,528	62,687	451	505
Connecticut	33,912	34,984	211	236
District of Columbia	8,180	7,873	70	78
Indiana	59,286	63,900	499	559
Kansas	36,373	41,547	300	336
Kentucky	57,737	67,292	365	409
Maine	15,496	17,058	133	149
Maryland	33,972	35,710	284	318
Massachusetts	87,709	87,338	619	699
Michigan	83,910	89,845	648	726
Minnesota	51,942	56,135	350	392
New Hampshire	8,778	9,237	70	78
New York	226,108	225,469	1,412	1,581
North Carolina	73,554	85,310	684	889
Ohio	113,054	129,660	834	934
Oregon	13,540	15,518	137	153
Pennsylvania	207,685	228,988	1,416	1,586
South Carolina	44,624	55,306	498	647
Utah	13,040	13,864	109	122
Vermont	7,032	7,604	56	63
Virginia	60,785	66,356	502	562
Washington	25,112	28,338	216	242
Wisconsin	54,781	61,180	263	295

[1] For method used in estimating births see pp. 18–19.
[2] 12 per cent added for each State except Massachusetts where 13 per cent was added, and North Carolina and South Carolina where 30 per cent was added in each State.

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